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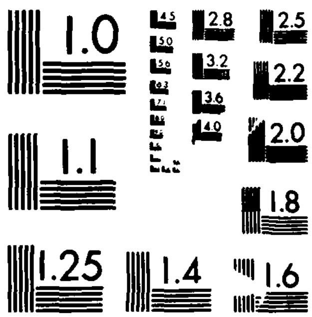


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VOLUME 2 of 2

(3)



INSTALLATION RESTORATION PROGRAM
PHASE II - CONFIRMATION/QUANTIFICATION

STAGE 1

REPORT FOR

BEALE AIR FORCE BASE,
MARYSVILLE, CALIFORNIA



AEROVIRONMENT INC.
825 MYRTLE AVENUE
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MAY 1987
FINAL (SEPT 1985 - MAY 1987)

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PREPARED FOR

HEADQUARTERS STRATEGIC AIR COMMAND/COMMAND SURGEON'S OFFICE (SAC/SGPB)/BIOENVIRONMENTAL ENGINEERING DIVISION/OFFUTT AIR FORCE BASE, NEBRASKA 68113

UNITED STATES AIR FORCE/OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (OEHL)/TECHNICAL SERVICES DIVISION (TS)/BROOKS AIR FORCE BASE, TEXAS 78235

AV-FR-86/517R2

# INSTALLATION RESTORATION PROGRAM
# PHASE II - CONFIRMATION/QUANTIFICATION

STAGE 1

REPORT FOR

BEALE AIR FORCE BASE,
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STRATEGIC AIR COMMAND
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PREPARED BY


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CONTRACT NO. F33615-83-D4000, DELIVERY ORDER No. 11
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CAPT. ROBART BAUER
TECHNICAL SERVICES DIVISION (TS)

UNITED STATES AIR FORCE
OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (USAFOEHL)
TECHNICAL SERVICES DIVISION (TS)
BROOKS AIR FORCE BASE, TEXAS 78235-5501

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APPENDICES

# APPENDIX C

Statement of Work

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Installation Restoration Program
Phase II (Stage 1), Beale AFB, CA

I. The overall objective of the Phase II investigation is to define the magnitude, extent, direction, and rate of movement of identified contaminants in the ground water. A series of staged field investigations may be required to meet this objective. The contractor shall recommend any additional investigations required beyond this stage including an estimate of costs.

The purpose of this task is to undertake a field investigation at Beale AFB CA: (1) to determine the presence or absence of environmental contamination within the specified areas of investigation; (2) if contamination exists, to determine the potential for migration of these contaminants in the various environmental media; and (3) to identify potential environmental consequences and health risks of migrating pollutants based on applicable local, state and/or federal standards.

The Phase I IRP report (mailed under separate cover) incorporates the background and description of the sites for this task.

A. The contractor shall be required to perform the following general specifications in association with the accomplishment of the individual tasks of this contract unless otherwise identified in the task specific work:

1. Determine the aerial extent of each site by reviewing available aerial photos of the base, both historical and the most recent panchromatic and infrared, and by field reconnaissance.

2. Inventory all wells on base (active, inactive, abandoned) and include map with locations in an appendix of report.

3. Permanently mark each location where surface water, soil, or sediment samples are taken. Record and document the location on a project site map.

4. Wells shall be completed and installed as follows:

a. Monitor all well drilling and exploratory borehole operations with a photo-ionization meter or equivalent organic vapor detection device to identify potential generation of hazardous and/or toxic materials. In addition, the contractor shall monitor drill cuttings for discoloration and odor. During drilling operations, if soil cuttings are suspected to be hazardous, the contractor shall containerize them in new, unused drums and test them for EP Toxicity and Ignitibility. The results of these tests shall be included in boring logs. A maximum of 12 samples shall be collected for EP Toxicity and Ignitibility testing. In addition, the contractor shall comply with all applicable EPA, AFOSH, OSHA, State and any

other agencies regulations/procedures concerning safety during drilling and sampling and analysis procedures. If equired, a safety plan shall be directly filed with the agencies.

b. Well completion shall comply with U.S. EPA publication 330/9-51-005, NEIC Manual for Ground Water/Subsurface Investigations at Hazardous Waste Sites and State of California requirements for monitoring well installation. Only screw type joints shall be used. Glued fittings are not permitted.

c. The exact location and number of monitor wells, borings and augerings for each site shall be determined in the field by the contractor in consultation with the OEHL project manager. The approximate locations and recommended number and depth of wells (including screening lengths), borings and augerings for sites under investigation are given in the site specific section of the task. Monitor wells and borings at all landfill sites shall be drilled around the perimeter and outside of the landfill areas.

d. Drill all wells using air-rotary with casing drive or equivilent equipment. Collect soil samples for stratigraphic control purposes at 5-foot intervals (unless otherwise specified in site specific work). Include pilot boring log and well completion summaries in the final report, (as specified in Item VI below).

e. Total footage of all wells in this task shall not exceed 2600 linear feet. Drill a maximum of 20 wells. Maximum depth of each well shall not exceed 130 linear feet. After identifying the saturated zone, a four-inch, 20-foot long, stainless steel screen shall be emplaced below the water table surface with a four-inch, 10-foot long, stainless steel casing above the screen. The remainder of the well shall be completed with four-inch diameter low carbon steel casing, using threaded nonglued fittings from the stainless steel casing section to the land surface. Total screening for all wells in this task shall not exceed 400 linear feet. The screen shall consist of four-inch diameter, stainless steel. Cap the screen at the bottom. All connections shall be flush-joint threaded.

1) Gravel pack the annulus of the screened zone with washed and bagged rounded sand or gravel with a grain size distribution compatible with the screen and formation. Place the gravel pack from the bottom of the borehole to five feet above the tip of the well screen. Granulated or pelletized bentonite shall be tremied above the gravel pack to a thickness of feet. Insure the bentonite forms a complete seal. Pump grout the remainder of the hole to land surface with a grout mixture of 6:1 Type 1 Portland cement ("9" sack mixture) and bentonite powder.

2) Complete each well with a cap and locking hasp and clearly number each well with an exterior paint or metal die stamp. If the base determines the well is in an area which needs protection, install three three-inch diameter steel guard post radially away from each wellhead. Each

guard post shall be six feet in total length. Recess the guard post two feet into the ground and insure they are removable. Provide a locking mechanism to prevent unauthorized removal.

e. If base officials determine the well stick-up is a concern in an area, complete the well flush with the land surface. Cut the well casing two to three inches below land surface. Complete the flush to ground installation by cementing a cast-iron locking lid and valve box assembly around the well. Insure that free drainage is maintained within the valve box to prevent infiltration of surface water. A maximum of 6 wells shall be considered for flush land surface installation.

f. Following completion of each well, the well shall be developed to provide maximum yield and sand-free conditions. Development of the wells shall be accomplished using a submersible pump, except, where insufficent water is available a bailer shall be used.

g. Determine by survey the elevations of all newly installed monitoring wells to an accuracy of +0.05 feet with respect to a base bench mark. Horizontally locate all wells to an accuracy of one foot. Record the positions on both project and site maps. Bench marks used must have been previously established from and are traceable to a USCGS/USGS survey marker.

h. Measure water levels at all monitoring wells as feet below the ground surface or below the top of the casing elevation to the nearest 0.01 foot. Record elevations as mean sea levels. Measure static water levels in wells using an electric tape prior to each round of sampling and at the time of well development after the water level has stabilized. A potentimetric surface map shall be generated each time static water levels are collected.

5. Evaluate available techniques for well abandonment that are applicable to the type of monitoring wells and geological conditions for Beale AFB. This evaluation shall consider that these wells shall be abandoned at some future date after the study objectives have been met and there is no longer a need for the wells. Provide recommendations for candidate method(s) or technique(s) to apply, including relative costs. The actual process of well abandonment is not a part of this study or Air Force activities at this time.

6. Drill a maximum of 39 shallow exploratory borings using hollow-stem auger or equivalent technique. The total footage of the exploratory borings shall not exceed 620 linear feet. Each exploratory boring shall not exceed 15 linear feet unless otherwise specified in site specific tasks. Soil samples shall be collected using a stainless steel split-spoon sampler (ASTM Method D-1536). Soil samples shall be collected at 5-foot intervals, (unless otherwise specified in site specific tasks), and at any major soil interface. Two soil samples per borehole shall be collected for chemical analysis, unless otherwise specified in site specific task. All remaining soil samples from each borehole shall be archived

frozen and maintained for possible future analysis. Soil samples shall be maintained for the duration of the contract effort. Upon completion of operations at each boring grout the borehole from bottom of the hole to the land surface in order to prevent downhole contamination.

7. Sampling and analysis shall be conducted as follows:

a. All water samples (ground water) shall be analyzed on site by the contractor for pH, temperature and specific conductance. Sampling, maximum holding time and perservation of samples shall strictly comply with the following references: Standard Methods for the Examination of Water and Wastewater, 15th Ed. (1980), p. 35-42; ASTM, Section 11 Water and Environmental Technology; Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA Manual 600/4-79-020, pp. xiii to xix (1979). All chemical analyses (water and soil) shall meet the required limits of detection for the applicable EPA method identified in Attachment 2.

b. Purge wells prior to sampling. Purging shall be complete when the pH, temperature, specific conductance, color and the odor of the discharge are noted to stabilize and at least three well volumes have been displaced. Conduct purging operations using a submersible pump and all sampling using a Teflon bailer. As the first step of ground water sampling operations at each well, collect static water level measurements to an accuracy of 0.01 feet with respect to an established surveyed marked point on the well casing.

c. All groundwater and surface water samples shall be collected twice, (ideally once in the wet and once in the dry season) at two different synoptic periods. Soil boring, bottom sediment and hand auger samples shall be collected for analysis only once (at first synoptic period).

d. Locations where surface water or sediment samples are taken, or where soil exploratory borings are drilled shall be marked with a permanent marker, and the location marked on a project map of the site.

e. Field data collected for each site shall be plotted and mapped. The nature, magnitude, and potential for contaminant flow within each zone to receiving streams and groundwaters shall be estimated. Upon completion of the sampling and analysis, the data shall be tabulated in the next R&D Status Report as specified in Item VI below. All raw data shall remain in the lab for one year, and will be provided to USAF upon request.

f. All ground water samples shall be split in the field. One set of samples shall be analyzed by the contractor and the other set of samples shall be delivered immediately, (the same collection day), to the field government point of contact (POC). The field POC will select 10% of the split samples for subsequent shipment and analysis and deliver them to the contractor within 24 hours of receipt. The contractor shall supply all packing and shipping materials for the field POC's use in packaging the

split samples. The contractor shall accept from the field POC the packaged samples for immediate shipment (within 24 hours) for analysis through overnight delivery to:

USAF OEHL/SA
Bldg 140
Brooks AFB TX 78235-5501

The samples sent to the USAF OEHL/SA shall be accompanied by the following information:

(1) Purpose of sample (analyte)
(2) Installation name (base)
(3) Sample number (on containers)
(4) Source/location of sample
(5) Contract Task Numbers and Title of Project
(6) Method of collection (bailer, suction pump, air-lift pump etc.)
(7) Volumes removed before sample taken
(8) Special Conditions (use of surrogate standard, special nonstandard preservations, etc.)
(9) Preservatives used
(10) Date and time of sampling
(11) Sampler's name

Forward this information with each sample by properly completing an AF Form 2752 (copy of form and instruction on proper completion mailed under separate cover). In addition, copies of field logs documenting sample collection should accompany the samples.

Maintain chain-of-custody records for all samples, field blanks, and quality control duplicates.

g. Second-column confirmation shall be required when detection limits exceed values identified in Attachment 2, for EPA Methods 601, 602, 608, 8010, 8020 and Standard Methods 509A and 509B. Conduct second-column confirmation on a maximum of 50% of the samples collected for these analyses.

h. Include second column confirmation results in the report. These shall include what columns were used, conditions, and the two different retention times for major components.

i. Analyze an additional 10% of all samples, for each parameter identified, for field quality control purposes, as indicated in Attachment 1. Include all quality control procedures and data in final reports.

j. Summarize sampling methods used, detection levels, and holding times in a table included in the Appendix.

k. Internal quality control procedures and data (lab blanks, lab spikes, and lab duplicates) as well as field quality control data shall be included in the draft finals reports.

8. Decontamination Procedures:

a. All sampling equipment, including components of sampling interface, shall be decontaminated prior to use between samples, and between sampling locations to avoid cross-contamination. Sampling equipment and interface shall be thoroughly washed with a laboratory-grade detergent followed by clean water, solvent (methanol) and distilled water rinses. Sufficient time shall be allowed for the solvent to evaporate and for the equipment to dry completely. The monofilament line or steel wire used to lower bailers into the well shall be dedicated to each well or discarded after each use. The calibrated water level indicator for measuring well volume and fluid elevation must be decontaminated before use in each well.

b. The drilling rig and tools shall receive thorough initial cleaning and be decontaminated after each borehole. As a minimum, drill bits shall be steam cleaned after each borehole is installed. Drilling shall proceed from the "least" to the "most" contaminated areas, if possible.

9. Conduct a literature search to complement the Phase I report (mailed under separate cover) for local hydrogeologic conditions. Data generated in this literature search shall complement Phase I Report data such that the following list will be complete. This list of data shall be utilized by the contractor to pinpoint well locations, sampling points, etc. In addition, this data shall be included in Appendix D of the Final Report of this effort.

a. Topographic data

b. Geologic data

(1) Structure

(2) Stratigraphy

(3) Lithology

c. Hydrologic data

(1) Location of existing wells, observation holes and springs within a one-mile radius of sites to be investigated

(2) Groundwater table and piezometric contours

(3) Depth to water

(4) Quality of water

(5) Recharge, discharge and contributing areas

d. Data on existing wells, observation holes, and springs within a one-mile radius of sites to be investigated

(1) Location, depth, diameter, types of wells, and logs

(2) Static and pumping water level, hydrographs, yield, specific capacity, quality of water

(3) Present and projected groundwater development and use

(4) Corrosion, incrustation, well interference, and similar operation and maintenence problems

(5) Location, type, geologic setting, and hydrographs of springs

(6) Observation well networks

(7) Existing water sampling sites

e. Aquifer data

(1) Type, such as unconfined, artesian, or perched

(2) Thickness, depths, and formational designation

(3) Boundaries

(4) Transmissivity, storativity, and permeability

(5) Specific retention

(6) discharge and recharge

(7) Ground and surface water relationships

(8) Aquifer models

f. Climatic data

(1) Precipitation

(2) Evapotranspiration

10. All well drilling, development, purging, and sampling methods must conform to State and other applicable regulatory agencies requirements. Include in the Appendix the names of all approving State and other regulatory personnel and dates that they accepted drilling techniques, well development, purging, and sampling methods.

11. Plot and map field data for each site. Estimate the nature of contamination and the magnitude and potential for contaminant flow within each site to receiving streams and ground waters. Upon completion of the sampling and analysis, tabulate the data in the next R&D Status Report (Atch 1, Sequence 1 as specified in Item VI).

B. The following are the site specific task to be accomplished in this contract effort: (Attachment 1 identifies site components and samples to be collected.)

1. Site 1. Discharge Area No. 1 (DA-1) - West Drainage Are

a. Install one ground water monitoring well according to Section I. A. 4. in an area immediately adjacent to the site in a downgradient (southwesterly) direction.

b. Collect ground water samples from the well according to Section I.A.7. Analyze each ground water sample for the analytes indicated in Table 1 under DA-1.

c. Collect one surface water, bottom sediment and two-foot hand auger core sample from four locations along the unnamed creek into which DA-1 discharges. Take three sets of samples downstream of the oil-boom installed by base personnel and one set within the oil-boom to establish a "worst case" scenario. One sampling point shall be located where the unnamed creek crosses the base boundary. The samples shall be analyzed for the parameters listed in Table 1 under DA-1.

d. Also, collect one groundwater sample from each of the nine Base Production Wells according to Section A.7. Analyze each groundwater sample for the analytes listed in Table 1 under DA-1.

2. Site 2. Injection Well No. 2, (INJ-2).

a. Install one groundwater monitoring well according to Section I.A.4. Determine the exact location in the field, but generally locate the well in a downgradient direction between injection wells 1 and 2.

b. Collect groundwater samples from the new and existing monitoring well. Collect samples according to Section I.A.7., and analyze for parameters listed in Table 1 under INJ - 2.

c. Drill four exploratory soil borings according to Section I.A.6. Place one boring downgradient and in close proximity to each of the

three injection wells. Locate one boring upgradient from the injection wells to establish background conditions. The exact location of the borings shall be determined in the field.

d. Select two of the four soil samples collected in each exploratory boring for a maximum of eight soil samples, and analyze the samples for the paraameters listed in Table 1 under INJ - 2.

e. Select a maximum of 3 soil samples from the sampling intervals at groundwater interfaces collected in the process of well installation, and analyze the samples for the parameters listed in Table 1 under INJ - 2.

f. Collect one groundwater sample from the four existing monitoring wells ground the photowaste sludge ponds according to Section I.A.7. Analyze each ground water sample for parameters listed in Table 1 under INJ - 1.

3. Site 3. Fire Protection Training Areas No. 1 and 2 (FPTA 1 & 2)

a. Install five ground water monitoring wells according to Section I.A.4. Determine the exact location in the field, but the wells shall encircle the area of FDTA 1 & 2.

b. Collect groundwater samples from each well according to Section I.A.7. Analyze each ground water sample for the analytes listed in Table 1 under FPTA 1 & 2.

c. Drill eight exploratory soil borings according to Section I.A.6. Place three borings within each fire training area, to determine the vertical extent of soil contamination. Locate one boring upgradient from fire training area to establish background conditions and one downgradient of underground storage tanks. The exact location of the borings shall be determined in the field.

d. Select three of the four soil samples collected in each exploratory boring for a maximum of 24 soil samples from the borings and analyze them for the parameters listed in Table 1 under FPTA 1 & 2.

e. Collect two bottom sediment samples from the overflow pond and analyze them for the parameters listed in Table 1 under FPTA 1 & 2.

f. Collect two 2-foot core samples with a hand auger within the overflow collection pit, and three core samples from downstream locations within the drainage ditch receiving drainage from overflow collection pit. The core samples shall be subdivided into zero-one and one-two foot intervals for a total of ten core samples. The ten core sample shall be analyzed for parameters listed in Table 1 under FPTA 1 & 2.

4. Site 4. Discharge Area No. 2 (DA-2) - Battery Shop Dry Well

a. Install one ground water monitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direction from the site.

b. Collect groundwater samples from the well according to Section I.A.7. Analyze each groundwater sample for the analytes listed in Table 1.

c. Soil samples shall be collected in the well installation at the 15, 20, 25 and 30 foot intervals, and analyzed for the parameters listed in Table 1 under DA-2.

d. Drill one exploratory soil boring to 30 linear feet according to Section I.A.6. Determine the exact location in the field, but generally place the boring in an upgradient direction from dry well.

e. Soil samples collected in the exploratory boring at 15, 20, 25 and 30 foot intervals shall be analyzed for the parameters listed in table 1 under DA-2.

5. Site 5. Discharge Area No. 3 (DA-3) - SR-71 Shelter

a. Install one groundwater monitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direction from the site.

b. Collect ground water samples from the well according to Section I.A.7. Analyze each ground water sample for the analytes listed in Table 1 under DA-3.

c. Drill six exploratory soil borings according to Section I.A.6. Place five borings at locations in the pad runoff area. Locate one boring upgradient from the pad runoff area to establish background conditions. The exact locations of the borings shall be determined in the field.

d. Monitor boring operations with a photo-ionization meter or equivalent organic vapor dector to identify potential generation of vapors or gases. Visually inspect soil cutting for discoloration and note the presence of any odor in soil. Results shall be documented in boring logs.

e. Select three samples from each exploratory boring for total of 18 soil samples and analyze them for the parameters listed in Table 1 under DA-3.

6. Site 6. Landfill No. 2 (LF-2)

a. Install four groundwater monitoring wells according to Section I.A.4. Determines the exact location in the field, but generally place one monitoring well upgradient of the site, one monitoring well between LF-2 and LF-3, and two monitoring wells downgradient of the site. The upgradient well shall be located such that it shall serve to provide background conditions for both LF-2 and LF-3.

b. Collect groundwater samples from each well according to Section I.A.7. Analyze each groundwater sample for the analytes listed in Table 1 under LF-2.

7. Site 7. Discharge Area No. 4 (DA-4) - Biological Production Site

a. Obtain one-foot hand auger core samples at 16 locations within the fields used for disposal of incinerated wheat rust material. use the 16 core samples to create four composite samples. Exact location of core samples shall be determined in the field.

b. Aanlyze the four composite soil samples for the parameters listed in Table 1 under DA-4.

8. Site 8. Discharge Area No. (DA-6) - J-57- Test Cell

a. Install one groundwater monitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direction from the site.

b. Collect groundwater samples from the well according to Section I.A.7. Analyze each groundwater sample for the analytes listed in Table 1 under DA-6.

c. Collect one two-foot hand auger core at three downstream locations receiving drainage from the site between the site and Reed's Creek. These cores shall be subdivided into one-foot segments for a total of six core segments (zero-one and one-two feet) and analyzed for the parameters listed in Table 1 under DA-6.

9. Site 9. Discharge Area No. 9 (DA-9) - Entomology Bldg 2560

a. Drill three exploratory soil borings according to Section I.A.6. Place two borings within the gravel pad and overflow area and locate one boring upgradient from the gravel pad and overflow area to establish background conditions. The exact locations of the borings shall be determined in the field.

b. Select six soil samples from the borings and analyze them for the parameters listed in Table 1 under DA-9.

10. Site 10. Discharge Area No. 5 (DA-5) - J-53 Test Cell

a. Install one groundwater monitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direction from the sote.

b. Collect groundwater samples from the well according to Section I.A.7. Analyze each groundwater sample for the annalyte listed in Table 1 under DA-5.

c. Collect four two-foot hand auger core samples one each at three downstream locations within the ditch receiveing drainage from the site and one upstream location to establish background conditions in the ditch. These cores shall be subdivided into one-foot segments and analyzed for the parameters listed in Table 1 under DA-5.

11. Site 11. Discharge Area No. 7 (DA-7) - AGE Maintenance

a. Install one ground water mnitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direciton from the site.

b. Collect groundwater samples from the well according to Section I.A.7. Analyze each groundwater sample for the parameters listed in Table 1 under DA-7.

c. Drill four exploratory soil borings accordiong to Section I.A.6. Place three borings in the gravel pad area receiving washdown water from the AGE maintenance shops and locate one upgradient boring from the gravel bed and area receiving wash down water to establish background conditions. Exact locations of the boring shall be determined in the field.

d. Select two soil samples from each exploratory boring for a total or total of eight samples and analyze them for the parameters listed in Table1 undewr DA-7.

e. Collect one two-foot hand auger core sample at four locations within the drainage ditch receiving drainage from the AGEW Maintenance Shops. These cores shall be subdivided into one foot segmants (zero-one and one-two feet) for a total of eight segments and analyzed for the parameters listed in Table 1 under DA-7.

12. Site 12. Discharge Area No. 10 (DA-10) - Entomology Bldg 440

a. Drill three exploratory soil borings according to Section I.A.6. Place two borings within the gravel pad and overflow area and locate one boring upgradient from the gravel pad and overflow area to establish background conditions. The exact locations of the borings shall be determined in the field.

b. Select two soil samples from each exploratory boring for a total of 6 samples and analyze them for the parameters listed in Table 1 and DA-10.

13. Site 13. Landfill No. 1 (LF-1)

a. Perform magnetometer and Ground Penetrating Radar (GPR) surveys in the area of Landfill No. 1 and the covered trenches immediately west of the landfill to further define the site and locate buried drums for later investigations if warranted. Conduct the survey as a wide grid survey.

b. Install two groundwater monitoring wells according to Section I.A.4. Determine the exact location in the field, but generally place the wells in a downgradient direciton from the site.

c. Collect ground water samples from each well according to Section I.A.7. Analyze each groundwater sample for the analytes specified in Table 1 under LF-1.

d. Collect one surface water and bottom sediment sample from three locations adjacent to and downstream along Hutchinson Creek which flows next to the landfill, and collect one the same samples at a location adjacent to but upstream of the landfill. Bottom sediment samples shall be collected only once for a total of four samples, and surface water samples shall be collected twice for a total of eight samples. Analyze the surface water and bottom sediment samples for the parameters listed in Table 1.

14. Site 14. Transformer Drainage Area (DA-8).

Collect one two-foot long hand auger cores at 12 locations within the bermed site. Divide the cores into one-foot intervals (zero-one and one-two feet) and analyze one soil sample per interval per core (total 12) for the parameters listed in Table 1 under DA-8.

15. Site 15. Landfill No. 3 (LF-3)

a. Install two ground water monitoring wells according to Section I.A.4. Determine the exact location in the field, but generally place the wells in a downgradient direction from the site.

b. Collect one groundwater samples from each well according to Section I.A.7. Analyze each groundwater sample for the analytes listed in Table 1 under LF-3.

16. Site 16. EEOD Disposal Area (EEOD)

Collect three surface grab soil samples from the scrap metal disposal trench and three surface grab soil samples from the current

ordinance burn pit. Create one composite soil sample from the three grab samples per pit for a total of two composite samples. Analyze each composite sample for the analytes listed in Table 1 under EEOD.

17. Site 17. Best Slough (BS).

a. Drill six exploratory soil borings according to Section I.A.6. Locate five borings downgradient but in close proximity to existing trenches to determine if leachating is occurring and locate one boring upgradient from the trenches to establish background conditions. The exact locations of the borings shall be determined in the field.

b. Monitor boring operation with a photo-ionization meter or equivalent organic vapor detector to identify potential generation of vapors or gases. Visually inspect soil cuttings for discloration. Results shall be documented on boring logs.

c. Collect two one-foot long hand auger soil sample from three trenches in Best Slough and analyze the six soil samples for the parameters listed in Table 1 under BS.

d. Select two soil samples from each exploratory boring for a total of 12 samples and analyze for parameters listed in Table 1 under BS.

e. Collect one surface water sample from near by stream and analyze for the parameters listed in Table 1 under BS.

18. Site 18. Bulk Fuel Storage Facility (BFSF).

a. Drill four exploratory soil borings according to Section I.A.6., with following exception, the boreholes shall be drilled to a depth of 20 feet and core samples collected at each 2.5 foot interval. Locate three borings downgradient of the perimeter fence around the Bulk Fuel Storage Facility. Locate one boring upgradient of the facility to establish background conditions.

b. Monitor boring operation with a photo-ionization meter or equivalent organic vapor detector to identify potential generation of vaport or gases. Visually inspect soil cuttings for discoloration and noter the presence of any fuel odor in soil. Results shall be documented in the boring logs.

c. Select four soil samples from each borehole for a total of 16 soil samples and analyze for parameters listed in Table 1 under BFSF.

C. Well and Borehole Cleanup

Remove all clean well and borehole drill cuttings to municipal landfill and clear the general area following the completion of each well and boring. Only those drill cuttings suspected as being a hazardous waste

(based on discoloration, odor, or organic vapor detection instrument) shall be properly containerized and moved to locations within the installation (according to local civil engineering office requirements) by the contractor for eventual government disposal. The suspected hazardous waste shall be tested by the contractor for EP Toxicity (metals) and Ignitibility, and EPA Method 8010 and 8020. The contractor is not responsible for ultimate disposal of the hazardous drill cuttings. Disposal will be conducted by base personnel.

D. Technical Field Operations Plan

1. Develop a detailed field operations plan (Atch 1 Sequence 7, as specified in Item VI below) based upon the technical requirements specified in this task description for the proposed work effort. Be explicit with regards to field procedures. Include, but do not limit the plan to, field decontamination operations, sampling protocol, QA/QC field procedures, field schedule, tec. A guideline for the plan is provided under a separate cover.

E. Health and Safety

Comply with USAF, OSHA, EPA, state and local health and safety regulations regarding the proposed work effort. Use EPA guidelines for designating the appropriate levels of protection at study sites. Prepare a written Health and Safety Plan for the proposed work effort and coordinate it directly with applicable regulatory agencies. Provide an information copy of the Health and Safety Plan to the USAF OEHL prior to commencing field operations (i.e., drilling and sampling).

F. Data Review

1. Tabulate field and analytical laboratory results, including field and laboratory parameters and QA/QC data, and incorporate them into the monthly R&D Status Reports. Forward them to the USAF OEHL for review as soon as they become available as specified in Item VI below. Field and laboratory parameters shall include time and dates for sample collection, extraction and analysis.

2. Upon completion of each round of all analyses, tabulate and incorporate all results into an Informal Technical Information Report (Atch 1, Seq 2 as specified in Item VI below) and forward the report to USAF OEHL for review.

3. Data/results, generated throughout this undertaking, indicating a possibility of health risk (for example, contaminated drinking water aquifer) shall be reported immediately via telephone to the USAF OEHL Program Manager.

F. Reporting

1. A draft report delineating all findings of this field investigation shall be prepared and forwarded to the USAF OEHL (as specified in Item VI below) for Air Force review and comment. This report shall include a discussion of the regional/site specific hydrogeology, well and boring logs, data from water level surveys, groundwater surface and gradient maps, water quality and soil analysis results, available geohydrologic cross sections, and laboratory and field quality assurance/quality control information. The report shall follow the USAF OEHL supplied format (mailed under separate cover). The format is an integral part of this delivery order.

2. The results section of the report shall include water and soil analyses results, field quality control sample data, internal laboratory control data (lab blanks, lab spikes, and lab duplicates), and laboratory quality assurance procedures. Provide second column confirmation results and include which columns were used, the conditions, and retention times. Summarize the specific collection techniques, analytical method, holding time, and limit of detection for each analyte (Standard Methods, EPA, etc.).

3. The recommendation section shall address each site and list them by categories. Category I shall consist of sites where no further action (including remedial action) is required. Data for these sites are considered sufficient to rule out significant public health or environmental hazards. Category II sites are those requiring additional monitoring or work to quantify or further assess the extent of current or future contamination. Category III sites are sites that will require remedial actions (ready for IRP Phase IV actions). Recommendations for Category III sites shall include any possible influence on sites in Categories I and/or II due to their connection to the same hydrological system. Any dependency between sites in different categories shall be clearly stated. The contractor shall include a list of candidate remedial action alternatives including Long Term Monitoring (LTM) as remedial action and corresponding rationale, that, as a minimum, should be considered in selecting the remedial action for a given site. The list shall encompass alternatives that could potentially attain applicable environmental standards or criteria (state action levels). For contaminants that do not have standards, the contractor may use EPA recommended safe levels for non-carcinogens (Health Advisory or Suggested-No-Adverse-Response Levels) and target levels for carcinogens ($1 \times 10^{-6}$ cancer risk level). If not specifically requested, comprehensive cost or technical analyses of alternatives shall not be included. However, in those situations where field survey data indicate immediate corrective action is necessary, the contractor shall present specific, detailed recommendations. For each category above, the contractor shall summarize the results of field data, environmental or regulatory criteria, or other pertinent information supporting conclusions and recommendations.

4. For those sites in need of additional Phase II effort, identify specific requirements, if any, for future monitoring needed to determine the magnitude, extent, and direction of movement of detected contaminants. Identify potential environmental consequences of discovered contamination, where known. Provide estimates of costs by line items for additional investigations beyond this stage along with estimates of time required to accomplish the investigation. Furnish the cost data in a separately bound appendix to the final report.

5. Include in an appendix to the report the names of all local and/or state and other regulatory personnel and the dates they approved well drilling techniques, materials, well development, purging, and sampling methods. All well drilling, development, purging and sampling must conform to State and/or other regulatory agencies requirements.

G. Meetings

The contractor's project leader shall attend three meetings to take place at times to be specified by the USAF OEHL. The meetings shall take place at Beale AFB for a duration of one day each.

II. SITE LOCATION AND DATES:

Beale AFB CA
Date to be established

III. BASE SUPPORT:

A. The Base Point of Contact (POC) shall receive from the contractor the split samples and then select 10% of them, package them, and then deliver them back to the contractor within 24 hours for subsequent overnight shipment of USAF OEHL/SA as stated in paragraph I.A.6.

B. Base personnel shall assign the disposal points within the installation of all hazardous drill cuttings and contaminated groundwater.

IV. GOVERNMENT FURNISHED PROPERTY: None

V. GOVERNMENT POINTS OF CONTACT:

1. Capt Robart W. Bauer
USAF OEHL/TSS
Brooks AFB TX 78235
(512) 536-2158/2159
AV 240-2158/2159

2. MSgt Willaim Priest
USAF Hospital Beale/SGPB
Beale AFB CA 95903
(916) 634-4724
AV 368-2635

3. Colonel Ronald D. Burnett
   HQ SAC/SGPB
   Offutt AFB NE 68113
   (402) 294-4651
   AV 271-4651

VI. In addition to sequence numbers 1, 5, and 10 in Attachment 1 to the contract, which are applicable to all orders, the sequence numbers listed below are applicable to this order. Also shown are data applicable to this order.

| Sequence No. | Block 10 | Block 11 | Block 12 | Block 13 | Block 14 |
|---|---|---|---|---|---|
| 3 (1st Round of analysis) | O/Time | * | * | - | 5 |
| 3 (2nd Round of analysis) | O/Time | ** | ** | - | 5 |
| 4 | One/R | 86 Jun 13 | 86 Jun 20 | 87 Jan 31 | *** |
| 14 | Mthly | 85 Nov 04 | 85 Nov 08 | **** | 2 |
| 15 | Mthly | 85 Nov 04 | 85 Nov [illegible] | **** | 2 |

* Upon completion of 1st round of analysis

** Upon completion of 2nd round of analysis and before submission of 1st draft report

*** Two draft reports (25 copies each) will be required. After incorporating Air Force comments concerning the first draft report, the contractor shall supply the USAF OEHL with one copy of the second draft report. Upon acceptance of the second draft, the USAF OEHL will furnish a distribution list for the remaining 24 copies of the second draft. The contractor shall supply 50 copies plus the original camera ready copy of the final report.

**** Monthly thereafter

Table [illegible]. Sampling and Analytical Requirements [illegible]

| ANALYTE | METHOD | MEDIUM (**) | DA-1 | DIJ No.2 | FPTA 142 | DA-2 | DA-3 | LF-2 | DA-4 | DA-6 | DA-9 | DA-5 | DA-7 | DA-10 | LF-1 | DA-8 | LF-3 | EOD | BS | BFW | Hazardous Soils | Sub Total | 2nd Column Conf. (50%) | QA (10%) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Purgeable Halocarbons & Aromatics | EPA 601/602 + Xylene | GW | 20 | 12 | 10 | 2 | 2 | 8 | — | 2 | — | 2 | 2 | — | 4 | — | 4 | — | — | — | — | 68 | 34 | 7 | 109 |
| | | SW | 8 | — | 2 | — | — | — | — | — | — | — | — | — | 8 | — | — | — | 2 | — | — | 20 | 10 | 2 | 32 |
| Halogenated and Aromatic Volatile organics | EPA 8010/8020 | SB | — | 11 | 24 | 8 | 18 | — | — | — | — | — | 8 | — | — | — | — | — | 12 | 16 | 12 | 109 | 55 | 11 | 175 |
| | | BS | 4 | — | 2 | — | — | — | — | — | — | — | — | — | 4 | — | — | — | — | — | 12 | 22 | 11 | 2 | 35 |
| | | HA | 4 | — | 10 | — | — | — | 4 | 6 | — | 8 | 8 | — | — | — | — | — | 6 | — | — | 46 | 23 | 5 | 74 |
| Oil and Grease (IR) | EPA 413.2 | GW | 20 | 12 | 10 | 2 | 2 | 8 | — | 2 | — | 2 | 2 | — | 4 | — | 4 | — | — | — | — | 68 | — | 7 | 75 |
| | | SW | 8 | — | 2 | — | — | — | — | — | — | — | — | — | 8 | — | — | — | 2 | — | — | 20 | — | 2 | 22 |
| | | SB | — | 11 | 24 | 8 | 18 | — | — | — | — | — | 8 | — | — | — | — | — | 12 | 16 | — | 97 | — | 10 | 107 |
| | | BS | 4 | — | 2 | — | — | — | — | — | — | — | — | — | 4 | — | — | — | — | — | — | 10 | — | 1 | 11 |
| | | HA | 4 | — | 10 | — | — | — | — | 6 | — | 8 | 8 | — | — | 12 | — | — | 6 | — | — | 54 | — | 5 | 59 |
| Petroleum Hydrocarbons (IR) | EPA 418.1 | GW | — | — | 10 | — | — | — | — | 2 | — | 2 | — | — | — | — | — | — | — | — | — | 14 | — | 1 | 15 |
| | | SW | — | — | 2 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | 1 | 3 |
| | | SB | — | — | 24 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 16 | — | 40 | — | 4 | 44 |
| | | BS | — | — | 2 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | 1 | 3 |
| | | HA | — | — | 10 | — | — | — | — | 6 | — | 8 | — | — | — | — | — | — | — | — | — | 24 | — | 2 | 26 |
| Heavy Metals: Primary | * | GW | 20 | 12 | — | 2 | — | 8 | — | — | — | — | — | — | 4 | — | 4 | — | — | — | — | 50 | — | 5 | 55 |
| | | SW | 8 | — | — | — | — | — | — | — | — | — | — | — | 8 | — | — | — | — | — | — | 16 | — | 2 | 18 |
| | | SB | — | — | — | 8 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 8 | — | 1 | 9 |
| | | BS | 4 | — | — | — | — | — | — | — | — | — | — | — | 4 | — | — | — | — | — | — | 8 | — | 1 | 9 |
| | | HA | 4 | — | — | — | — | — | 4 | — | — | — | — | — | — | — | — | — | — | — | — | 8 | — | 1 | 9 |
| | | SG | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | — | — | 2 | — | 1 | 3 |
| Pesticides & Herbicides | Std 509A & 509B | GW | — | — | — | — | — | 8 | — | — | — | — | — | — | 4 | — | — | — | — | — | — | 12 | 6 | 1 | 19 |
| | | SW | — | — | — | — | — | — | — | — | — | — | — | 6 | 8 | — | — | — | 2 | — | — | 16 | 8 | 2 | 26 |
| | | SB | — | — | — | — | — | — | — | — | 6 | — | — | — | — | — | — | — | 12 | — | — | 18 | 9 | 2 | 29 |
| | | BS | 4 | — | — | — | — | — | — | — | — | — | — | — | 4 | — | — | — | — | — | — | 8 | 4 | 1 | 13 |
| | | HA | 4 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 6 | — | — | 10 | 5 | 1 | 16 |
| Phenols (total) | EPA 420.1 | GW | 20 | — | 10 | 2 | 2 | 8 | — | 2 | — | 2 | 2 | — | 4 | — | 4 | — | — | — | — | 56 | — | 6 | 62 |
| | | SW | 8 | — | 2 | — | — | — | — | — | — | — | — | — | 8 | — | — | — | 2 | — | — | 20 | — | 2 | 22 |
| | | SB | — | — | 24 | 8 | 18 | — | — | — | — | — | 8 | — | — | — | — | — | 12 | 16 | — | 86 | — | 9 | 95 |
| | | BS | 4 | — | 2 | — | — | — | — | — | — | — | — | — | 4 | — | — | — | — | — | — | 10 | — | 1 | 11 |
| | | HA | 4 | — | 10 | — | — | — | — | 6 | — | 8 | 8 | — | — | — | — | — | 6 | — | — | 42 | — | 4 | 46 |
| Acids and Base/Neutrals | EPA 625 | GW | — | 12 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 12 | — | 1 | 13 |
| | | SB | — | 11 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 11 | — | 1 | 12 |
| PCBs | EPA 608 | HA | — | — | — | — | — | — | — | — | — | — | — | — | — | 12 | — | — | — | — | — | 12 | 6 | 1 | 19 |
| General Explosive Scan | USATHAMA | HA | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | — | — | 2 | — | — | 2 |
| Lead | | GW | — | — | 8 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 8 | — | 1 | 9 |
| | | SB | — | — | 24 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 16 | — | 40 | — | 4 | 44 |
| | | BS | — | — | 2 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | 1 | 3 |
| | | HA | — | — | 10 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 10 | — | 1 | 11 |
| EP Toxicity Extraction for Metals | 40 CFR, Sub C, 261.24 | SB | — | — | — | — | — | — | 4 | — | — | — | — | — | — | — | — | — | — | — | 12 | 16 | — | 1 | 17 |
| EP Ignitability | 40 CFR, Sub C, | SB | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 12 | 12 | — | — | 12 |

[1] All soil analysis shall comply with California Assessment Methods (CAM), except those specifed for EP Toxicity and Ignitability. All soil analysis shall be accomplishe only once.

[2] Heavy Metals Primary includes: As, Ba, Cd, Pb, Hg, Se and Ag.

*Reference: EPA Methods for Chemical Analysis of Water and Wastes, EPA - 600/4-79-020

**GW = Ground Water
SW = Surface Water
BS = Bottom Sediment (Soil)
HA = Hand Auger (Soil)
SG = Surface Grab (Soil)

C-19

Attachment 1: List of Sites

| Site No. | Site Descriptions and Components | # of Samples (#) |
|---|---|---|
| 1 | Discharge Area No. 1 (DA-1) - West Drainage Area | |
| | ground water (GW) | 20 |
| | surface water (SW) | 8 |
| | bottom sediment (BS) | 4 |
| | hand auger (HA) | 4 |
| 2 | Injection Well No. 2 (INJ-2) | |
| | ground water | 12 |
| | soil boring (SB) | 11 |
| 3 | Fire Protection Training Areas No. 1 and 2 (FPTA) 1 & 2) | |
| | ground water | 10 |
| | surface water | 2 |
| | soil boring | 24 |
| | bottom sediment | 2 |
| | hand auger | 10 |
| 4 | Discharge Area No. 2 (DA-2) - Battery Shop Dry Well | |
| | ground water | 2 |
| | soil boring | 3 |
| 5 | Discharge Area No. 3 (DA-3) - 52-71 Shelter | |
| | ground water | 2 |
| | soil boring | 16 |
| 6 | Landfill No. 2 (LF-2) | |
| | ground water | 8 |
| 7 | Discharge Area No. 4 (DA-4) - Biological Production Site | |
| | hand auger | 4 |
| 8 | Discharge Area No. 6 (DA-6) - J57 Test Cell | |
| | ground water | 2 |
| | hand auger | 6 |
| 9 | Discharge Area No. 9 (DA-9) - Entomology Bldg 2560 | |
| | soil boring | 6 |

Attachment 1: List of Sites

| Site No. | Site Descriptions and Components | # of Samples (*) |
|---|---|---|
| 10 | Discharge Area No. 5 (DA-5) - J-58 Test Cell | |
| | ground water | 2 |
| | hand auger | 8 |
| 11 | Discharge Area No. 7 (DA-7) - AGE Maintanence | |
| | ground water | 2 |
| | soil boring | 8 |
| | hand auger | 8 |
| 12 | Discharge Area No. 10 (DA-10) - Entomology Bldg 440 | |
| | soil boring | 6 |
| 13 | Landfill No. 1 (LF-1) | |
| | ground water | 4 |
| | surface water | 8 |
| | bottom sediment | 4 |
| 14 | Transformer Drainage Area (DA-3) | |
| | hand auger | 12 |
| 15 | Landfill No. 3 (LF-3) | |
| | ground water | 4 |
| 16 | EEOD Disposal Area (EEOD) | |
| | surface grab (SG) | 2 |
| 17 | Best Slough (BS) | |
| | surface water | 2 |
| | soil boring | 12 |
| | hand auger | 6 |
| 18 | Bulk Fuel Storage Facility (BFSF) | |
| | soil boring | 16 |

*Numbers below include 2 rounds of sampling on groundwaters and surface waters, and 1 round of sampling on soils, bottom sediments and hand auger samples.

Attachment 2

Analytical Parameters, Parameters, Methods and Required Detection Units

| Parameter | Method | (ug/L for water - ug/g for soil) Level of Detection |
|---|---|---|
| Purgeable Halocarbons and Aromatics | EPA 601 & 602 | a |
| Halogenated and Aromatic Volatile Organics | EPA 8010 & 8020 | b |
| Oil and Grease (IR) Extraction | EPA 413.2<br>EPA 3550 | 100 |
| Petroleum Hydrocarbons (IR) Extraction | EPA 418.1<br>EPA 3550 | 100 |
| Heavy Metals Primary (7) | * | c |
| Pesticides and Herbicides | Std 509 A.B | d |
| PCBs | EPA 608 | 1.0 |
| Phenol | EPA 420.1 | 1 |
| Base/Neutrals and Acids | EPA 625 | ** |
| General Explosive Scan | USATHAMA | *** |
| EP Toxicity for Extraction of Metals | 40 CFR, Sub C 261.24 | e |
| EP Ignitability | 40 CFR, b C 261.21 | f |

[a] Detection limits for Purgeable Organics shall be as specified for the compounds by EPA Methods 601-602. Method: Federal Register, Vol. 44, No. 233, pp 69468-69475. This method should be strictly followed including these items:

Item 1.4 - This method is recommended by EPA for usy only by experienced

residue analysts or under the close supervision of such qualified persons.

Item 2.2 - This is most important. If interferences are encountered, (as in early peaks such as vinyl chloride), the method provides a secondary chromatographic column that will be helpful in resolving the compounds of interest from interferences. This must be done in the case of vinly chloride and so noted in the analysis report.

Item 3.3, 7.1-7.3 - These secions must be analyzed within the recommended holding times.

Item 8.3 - All samples must be analyzed within the recommended holding times. This must be followed without exception.

If analytes analyses exceed the detection limits identified below, second column confirmation is required:

| EPA Method 601 & 602 | Detection Level (ug/L) |
|---|---|
| Benzene | 0.7 |
| Carbon | 4.0 |
| Chloroform | 10 |
| 1,2 Dichloroethane | 0.1 |
| Methylene Chloride | 4.0 |
| Tetrachloroethylene | 4.0 |
| Toluene | 10 |
| 1,1,1-Trichloroethane | 10 |
| Trichloroethylene | 1.0 |
| Vinyl Chloride | 1.0 |
| Dichlorobenzene isomers | Sum greater than 10 |
| Any other organics | 10 |

Retention times on both columns must match before reporting positive value. If no match, it will be considered an interference.

If questions are encountered about certain contaminants, you may be asked to show both chromatograms used to rule out possible interferences.

[b] Items specified in footnote a above should be strictly followed. Detection limits for Purgeable Organics shall be as specified for compounds by EPA Methods 8010/8020. If analytes analyses exceed 10 ug/g in soil, second column confirmation is required.

[c] Primary Heavy Metals:

| Metal | Level of Detection water (ug/L) | soil (ug/g) |
|---|---|---|
| arsenic (As) | 10 | 1 |
| barium (Ba) | 200 | 20 |
| cadmium (Cd) | 10 | 1 |
| chromium (Cr) | 20 | 2 |
| lead (Pb) | 50 | 5 |
| mercury (Hg) | 1 | 0.1 |
| selenium (Se) | 10 | 1 |
| silver (Ag) | 10 | 1 |

[d]Pesticides/Herbicides

| Analyte | (ug/L-water, ug/g-soil) Level of Detection |
|---|---|
| Endrin | .02 |
| Lindane | .01 |
| Methoxychlor | .20 |
| Toxophen | 1 |
| 2,4-D | .06 |
| 2,4,5-TP | .06 |

If analytes analyses exceed the detection limits identified below, 2nd column confirmation shall be required.

| Standard Methods 509A and 509B | Detection Level ug/L |
|---|---|
| Lindane | 4.0 |
| 2,4-D | 10.0 |
| 2,4,5-TP (silvex) | 10.0 |
| Any other pesticide greater than | 10.0 |

"Retention times on both columns must match before reporting positive value. If no match, it will be considered and interference."

"If questions are encountered about certain contaminants, you may be asked to show both chromatogram used to rule out possible interferences."

[e]

| Metals | ug/L of leaching solution |
|---|---|
| As | 10 |
| Ba | 200 |
| Cd | 10 |
| Cr | 50 |
| Pb | 20 |
| Hg | 1 |
| Se | 10 |
| Ag | 10 |

[f] Find if sample is ignitable at 140 degrees F. or below. If so, it is hazardous waste.

[*] Ref: EPA Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.

[**] Levels of detection are as specified by EPA Method 625.

[***] Level of detection are as specified by USATHAMA.

## APPENDIX D

Sample Numbering System

## D. SAMPLE NUMBERING SYSTEM

All samples taken at Beale Air Force Base were given a six-digit sample number. This coding was devised for groundwater, surface water, bottom grab, soil borings, and hand auger samples. The first two digits indicate the number of the site from which the sample was taken, as follows: They are:

| | |
|---|---|
| 01 | West Drainage Ditch |
| 02 | Injection Well No. 2 |
| 03 | Fire Protection Training Area |
| 04 | Battery Shop Dry Well |
| 05 | SR-71 Shelter |
| 06 | Landfill No. 2 |
| 07 | Biological Production Site |
| 08 | J-57 Test Cell |
| 09 | Entomology Building 2560 |
| 10 | J-58 Test Cell |
| 11 | AGE Maintenance |
| 12 | Entomology Building 440 |
| 13 | Landfill No. 1 |
| 14 | Transformer Drainage Area |
| 15 | Landfill No. 3 |
| 16 | EEOD Disposal |
| 17 | Best Slough |
| 18 | Bulk Fuels Storage |
| R2 | Radian Wells (at site No. 2) |
| BP | Base Production Wells |

The second two digits of the soil, surface water or bottom sediment sample code identify the sampling location within the site. These numbers were assigned in chronological order. For example, the first location at a site was numbered XX-01-XX. Because upgradient or background locations were not necessarily known before field samples were taken, no specific identifiers were given for them.

For the groundwater samples, the second two digits indicate the number of the well from which the sample was taken. For example, 05-02-xx indicates a sample taken from Well No. 2 at Site 5.

The next digit of the soil sample code, a letter, indicates the type of sample, as follows:

| | |
|---|---|
| B | Bottom sediment |
| G | Groundwater |
| H | Hand auger |
| R | Surface grab |
| S | Soil boring |
| W | Surface water |

For soil samples, the last digit is a number which indicates the relative depth of the sample. For example, sample No. XX-XX-X1 is taken at a shallower depth than Sample No. XX-XX-X2 in the same sample location. However, this numbering system does not reflect the specific depth of the sample.

Thus the number 10-01-H2 identifies the second soil sample from a series taken at the first sample location at Site 10. If these samples were taken at five-foot intervals, this one would be from a five-foot depth, the first one being a surface sample.

The last two digits of a groundwater sample numbering code represent the chronological order in which a sample was taken for a specific set of parameters.

Thus DH 25 01 represents the first set of groundwater samples taken from Well 25.

AV quality assurance (QA) samples are numbered using the six-digit codes described above and are "blind" QA samples. This minimizes the possibility of prejudicial treatment being given to QA samples in the laboratory.

All QA samples (splits) sent to the Air Force OEHL were numbered according to the Air Force sample-numbering system outlined in Air Force Form 2752. Table C-1 correlates AV's sample codes with the USAF sample numbers, which were logged on samples sent to the OEHL laboratory.

TABLE D-1

| AV Sample No. | Parameter(1) | Air Force Sample No. |
|---|---|---|
| 17-01-S1 | Soil | GS-85-0254 |
| 09-02-S2 | Soil | GS-85-0255 |
| 03-04-S2 | Soil | GS-85-0256 |
| 03-07-S1 | Soil | GS-85-0257 |
| 03-02-S2 | Soil | GS-85-0258 |
| 05-02-S2 | Soil | GS-85-0259 |
| 02-02-S1 | Soil | GS-85-0260 |
| 12-02-S1 | Soil | GS-85-0261 |
| 18-02-S1 | Soil | GS-85-0262 |
| 05-03-S2 | Soil | GS-85-0263 |
| 18-02-S9 | Soil | GS-85-0264 |
| 18-01-S5 | Soil | GS-85-0265 |
| 05-06-S1 | Soil | GS-85-0266 |
| 03-02-H2 | Soil | GS-85-0267 |
| 11-04-H2 | Soil | GS-85-0268 |
| 01-02-B1 | Soil | GS-85-0269 |
| 17-03-H1 | Soil | GS-85-0270 |
| 14-05-H1 | Soil | GS-85-0271 |
| 01-01-W1 | Metals | GS-85-0272 |
| 01-01-W1 | Oil & Grease | GS-85-0272 |
| 01-01-W1 | Phenols | GS-85-0272 |
| R2-04-G1 | Oil & Grease | GN-86-0003 |
| R2-04-G1 | Phenols | GN-86-0003 |
| R2-04-G1 | Metals | GN-86-0003 |
| R2-04-G1 | Base/Neutrals & Acid | GN-86-0003 |
| R2-04-G1 | Volatile Organics | GN-86-0003 |
| 15-03-G1 | Oil & Grease | GN-86-0016 |
| 15-03-G1 | Phenol | GN-86-0016 |
| 15-03-G1 | Metals | GN-86-0016 |
| 15-03-G1 | Volatile Organics | GN-86-0016 |
| 02-01-G1 | Oil & Grease | GN-86-0240 |
| 02-01-G1 | Phenols | GN-86-0240 |
| 02-01-G1 | Metals | GN-86-0240 |
| 02-01-G1 | Volatile Organics | GN-86-0240 |
| 01-01-G1 | Oil & Grease | GN-86-0244 |
| 01-01-G1 | Phenols | GN-86-0244 |
| 01-01-G1 | Metals | GN-86-0244 |
| 01-01-G1 | Volatile Organics | GN-86-0244 |

# APPENDIX E

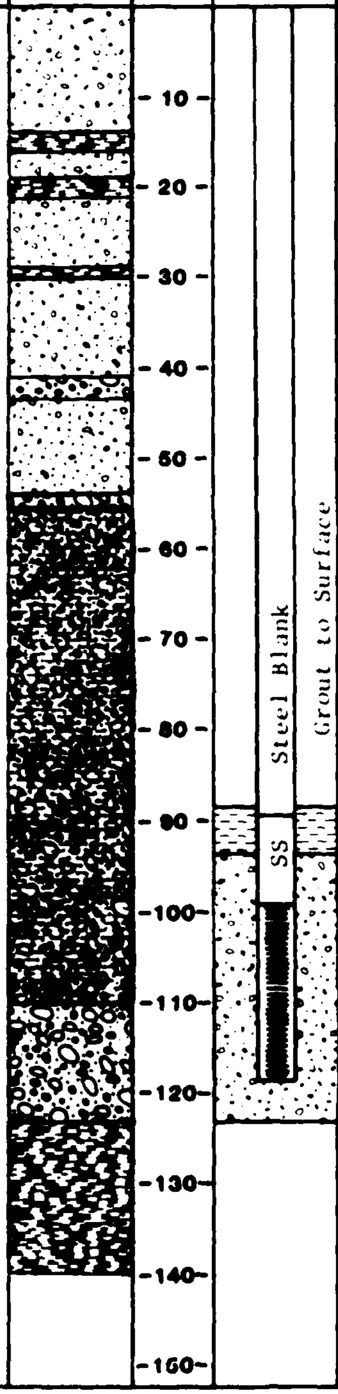
## Boring Logs

# WELL NO. 01-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** J. Miller/T. O'Gara

**Site** #1 West Ditch **Checked By** J. Miller

**Drilling Method** 8" Air Rotary **Date** 3/26-27/86

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Medium to coarse sand representing recent river deposition.<br><br>15-55 feet interlayered beds of sand with minor gravel and clay/silt. Occasional thin zones of coarse gravel. Clay layers are usually thin (1-5 feet).<br><br>Clay and coarse sand with small pebbles. Probably thin beds or interlayered mixtures.<br><br>Coarse sand and good gravel consisting in large part of dark volcanic detritus and occasional pieces of white welded tuff.<br><br>**Silty fine sand and clay** |  | | | Hole initially drilled by mud rotary to 140 feet. Continual caving and mechanical problems resulted in abandonment on 12-24-85. Redrill with air rotary/casing hammer on 3-27-86. |





AV-F-HW04

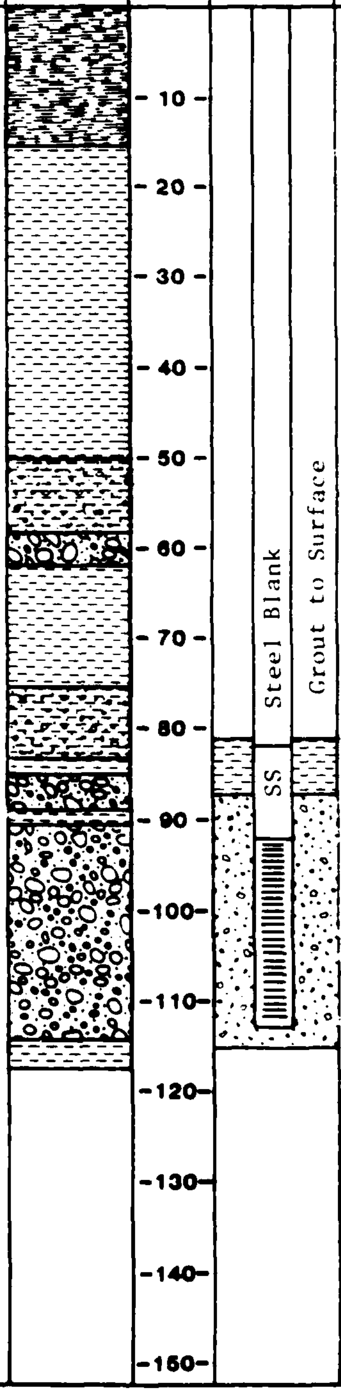
**WELL NO.** 02-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #2 Injection Well **Checked By** J. Miller

**Drilling Method** Air/Water Rotary 8" **Date** 11/15/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Red-brown silt with clay and fine sand. Clay decreases with depth. | | | | |
| Brown clay with minor sand. | | | | |
| 34-36 feet reddish clay. | | | | |
| Light brown sandy clay. | | | | |
| Sand and gravel with minor clay. | | | | |
| Red-brown clay with minor fine sand. | | | | |
| Red-brown clay and sand. | | | | |
| Sand and gravel with low to moderate amounts of clay; probably interbedded. | | | | |
| Sand and gravel with minor clay. | | | | |
| 110 feet plus clay. | | | | |



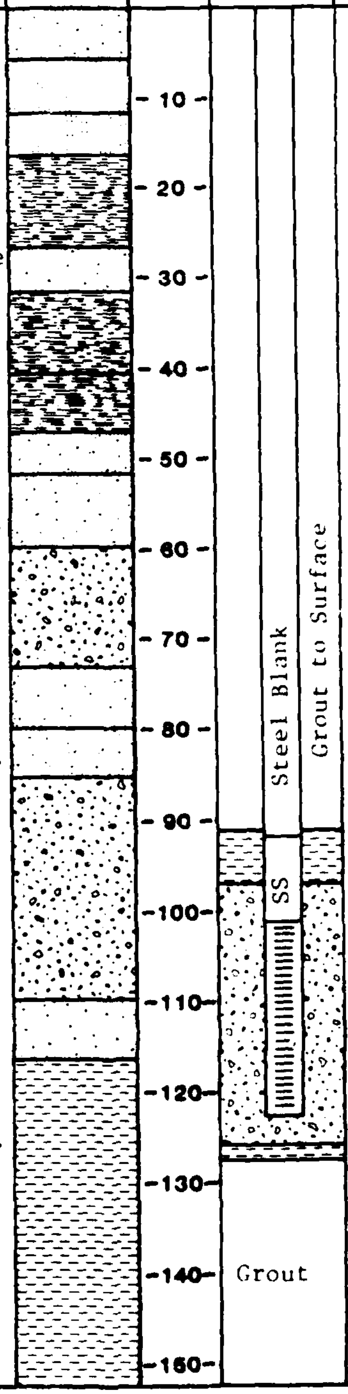
## WELL NO. 03-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #3 Fire Protection Training Area **Checked By** J. Miller

**Drilling Method** Air/Water Rotary 8" **Date** 11/16-17/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Light red-brown silt and fine sand with minor clay. | | | | |
| Light brown silt with minor clay and sand. | | - 10 - | | |
| Light brown silt. | | | | |
| Silt with clay. | | - 20 - | | |
| Fine sand with minor medium to coarse sand and silt. | | - 30 - | | |
| Light brown silt and clay becoming mostly silt with depth. | | | | |
| Silt and clay with minor coarse sand. | | - 40 - | | |
| Grey-brown fine sand and silt. | | - 50 - | | |
| Silt and fine sand, minor gravel and clay but clay increasing with depth. | | - 60 - | | |
| Grey brown silty sand and coarse sand. | | - 70 - | | |
| Red-brown fine-medium sand and silt. | | - 80 - | | |
| Grey brown silty sand and minor clay. | | | | |
| Coarse sand with minor fine sand. | | - 90 - | | |
| | | -100- | | |
| Fine sand and silt, minor clay. | | -110- | | |
| Pale red-grey clay (mottled) and purplish silt/clay, minor sand. Possibly decomposed bedrock in situ. | | -120- | | Drilled to 160 feet. Hit lower aquifer. Placed cement plug at 160 feet. Cemented hole from 128-160 feet followed by 2 feet of bentonite to seal cement from base of gravel pack. |
| | | -130- | | |
| | | -140- | Grout | |
| | | -150- | | |



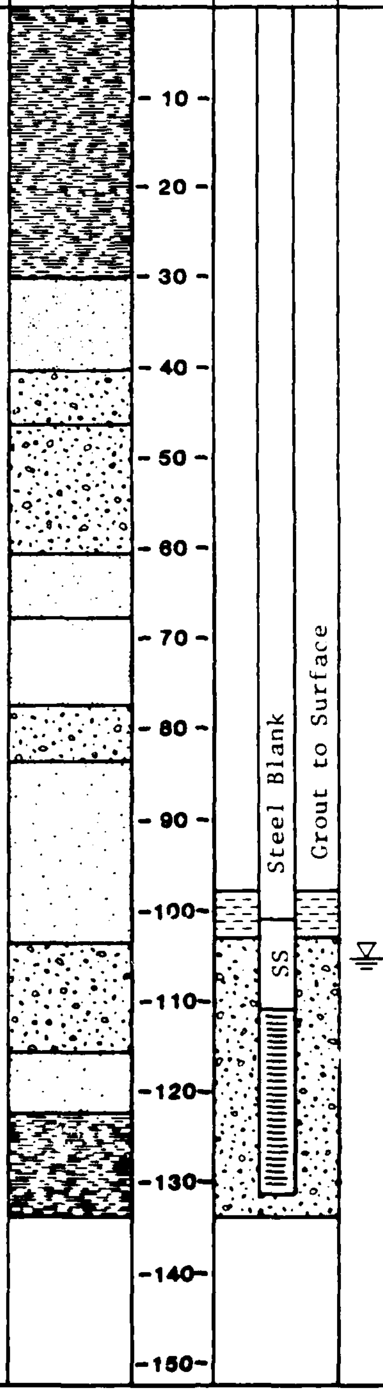
# WELL NO. 03-02

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** J. Miller

**Site** #3 Fire Protection Training Area **Checked By** T. O'Gara

**Drilling Method** Air/Water Rotary 8" **Date** 11/18-19/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Medium brown clay/silt with minor small gravel near surface. | | | | |
| Silty fine sand with minor clay. | | | | |
| Fine sand and minor silt. | | | | |
| Medium sand with coarse sand and small pebbles; 20% fine sand. | | | | |
| Fine sand with minor to moderate silt. | | | | |
| Silt with fine sand and minor clay. | | | | |
| Grey-brown medium grain sand grading down into minor fine sand and silt. | | | | |
| Silty fine sand with minor medium sand. | | | | |
| Medium to coarse sand with minor silt. | | | | |
| Reddish to faint purplish silty fine sand. Looks to be making water. | | | | |
| Purplish silt/clay with fine sand. Probably no water. | | | | |



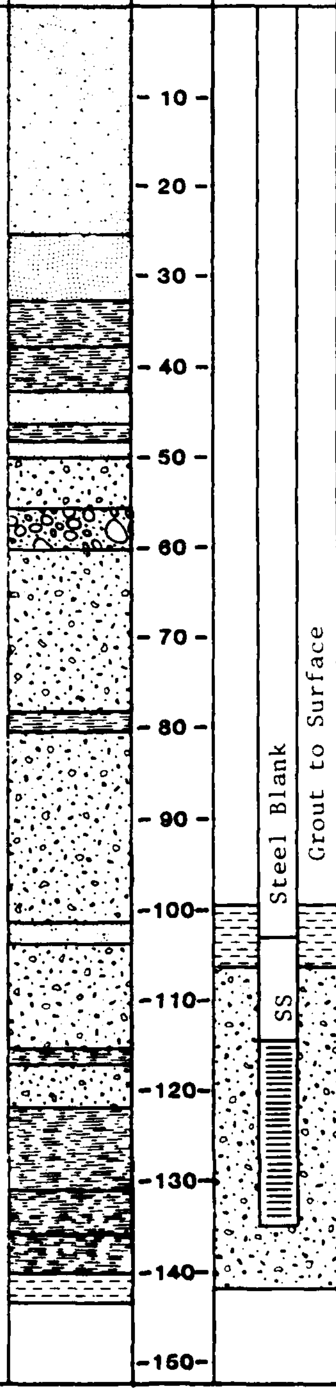
## WELL NO. 03-03

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** J. Miller

**Site** #3 Fire Protection Training Area **Checked By** T. O'Gara

**Drilling Method** Air/Water Rotary 8" **Date** 11/20-21/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Fine sand and silt with minor small pebbles. Pebbles decrease quickly with depth. | | | | |
| 20-25 feet. As above with silt and color changing from yellow-brown to medium brown. | | | | |
| Silt with minor fine sand. | | | | |
| Red brown silt and clay. | | | | |
| Chocolate brown silt/clay with fine sand. | | | | |
| Fine sand with 20-30% silt. | | | | |
| Silt and clay. | | | | |
| Fine sand and silt. | | | | |
| Fine sand, slightly moist. | | | | |
| Fine-medium sand with small gravel/ pebbles. | | | | |
| Medium sand and minor coarse sand with small pebbles (10-15%). Overall coarser with depth. | | | | |
| Light buff/brown silt and clay interlayered with fine sand. | | | | |
| Brown fine-medium sand grading into mostly grey-brown sand at 90 feet. 1-3 mm white crystals (calcite?) at 90 feet. | | | | |
| Thin, wet silt/sand lense with clay. Possible 1-2 foot perched water zone. | | | | |
| Medium brown sand with minor fine sand grading into coarse and medium sand at 111 feet plus. | | | | |
| Light brown silt/clay. | | | | |
| Medium, moist sand, brief smell of diesel fuel at 120 feet. | | | | |
| Light tan/brown silt and clay with minor fine sand. Wet to moist. | | | | |
| As above, but chocolate brown to medium brown. | | | | |
| Light tan/buff silt and clay. | | | | Makes water very slowly; approximately 3 gallons per day. Water zone in silt/clay. |
| Pale purple to red clay. | | | | |



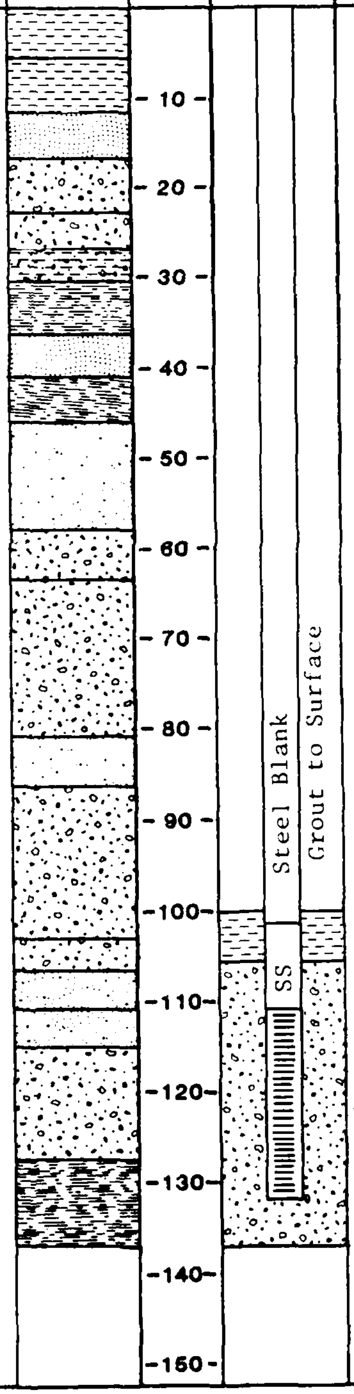
# WELL NO. 03-04

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating/J. Miller

**Site** #3 Fire Protection Training Area **Checked By** J. Miller

**Drilling Method** Air/Water Rotary 8" **Date** 11/25/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Light brown clay with silt and fine sand. | | | | |
| Brown clay, minor silt. | | 10 | | |
| Light brown to buff silt. | | | | |
| Light brown fine to medium sand, minor coarse sand. | | 20 | | |
| Red/brown fine to medium sand, minor coarse sand. | | | | |
| Sandy clay - brown. | | 30 | | |
| Grey-brown silty/clay. | | | | |
| Light brown silt. | | 40 | | |
| Grey brown silty/clay. | | | | |
| Sandy silt with minor clay and minor thin layers of brown fine to coarse sand. | | 50 | | |
| Variegated buff/brown medium sand with minor fine to coarse sand. | | 60 | | |
| Brown to grey fine to medium sand. | | 70 | | |
| Fine sand and silt with minor clay. | | 80 | | |
| Medium sand with minor fine and coarse sand/brown-grey. | | 90 | | |
| Light brown medium to fine sand, minor silt/clay. | | 100 | | |
| Light brown fine sand and silt. | | 110 | | |
| Fine to medium sand. | | | | |
| Medium sand with moderate amounts of coarse to fine sand. Moisture increasing beginning at 120 feet. | | 120 | | |
| Clay and silty clay with minor sand. Overall grey. | | 130 | | |
| | | 140 | | |
| | | 150 | | |



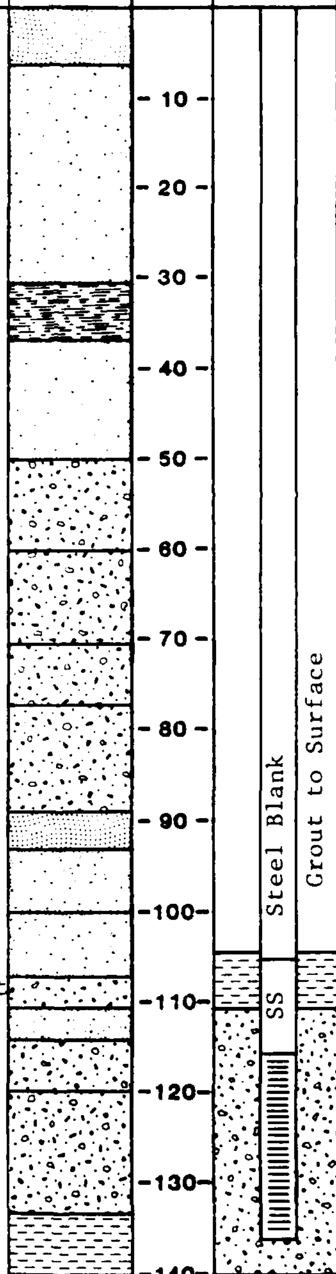
## WELL NO. 03-05

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #3 Fire Protection Training Area **Checked By** J. Miller

**Drilling Method** Air/Water Rotary 8" **Date** 12/9/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Light buff brown silt. | | | | |
| Silt and fine sand going from red brown to light brown at 20 feet and finally grey brown 25-30 feet. | | 10 | | |
| | | 20 | | |
| Grey brown silt/clay. | | 30 | | |
| Silt and sand with minor clay, light brown. | | 40 | | |
| Light brown fine sand with only minor silt. | | 50 | | |
| Dark brown fine to medium sand, minor coarse sand. | | 60 | | |
| As above with minor silt. | | 70 | | |
| Medium to fine, variegated brown sand. | | 80 | | |
| Light brown silt. | | 90 | | |
| Red-brown sand and silt. | | | | |
| Grey brown silt/sand with minor clay, becoming moist. | | 100 | | |
| Moist grey brown fine sand, minor silt | | | | |
| Brown fine sand/silt. | | 110 | | |
| Brown fine sand, possibly making water. | | 120 | | |
| Medium sand, variegated brown, moist. | | 130 | | |
| Blue/grey clay. | | 140 | | |
| | | 150 | | |



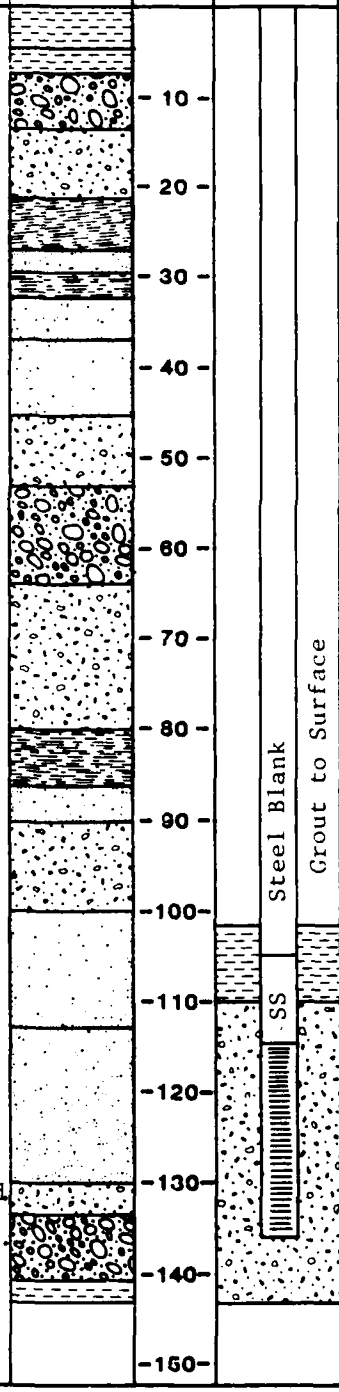
## WELL NO. 04-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #4 Battery Shop **Checked By** J. Miller

**Drilling Method** Air/Water Rotary 8" **Date** 12/5/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|




**Geologic Description**

4" concrete followed by light brown to buff clay.

Variegated red/brown to buff clay and minor sand.

Gravelly sand interlayered with fine to medium sand, minor cobbles.

Light-brown fine to coarse sand, minor gravel as thin layers.

Red/brown silty clay, minor coarse sand.

Light brown silt and sand.

Brown silt/clay, minor sand.

Brown silt/sand.

Light brown fine sand and silt with minor coarse sand.

Medium grained sand. Color varies from brown, red, black, yellow to grey. Probably acid effects.

Brown coarse sand with well rounded gravel. Gravel decreasing with depth.

Brown medium to coarse sand.

Light brown silty/clay with minor fine to coarse sand.

Light brown fine sand and silt.

Light brown fine to medium sand, minor silt.

Silty fine to medium sand, moist.

Light brown fine sand, silty and clay, minor coarse and medium sand. Moisture increases, becoming wet.

Medium sand with fine and coarse sand.

Coarse sand and gravel, making water.

Clay.

**Remarks**

Possible acid effects at 45-50 feet.

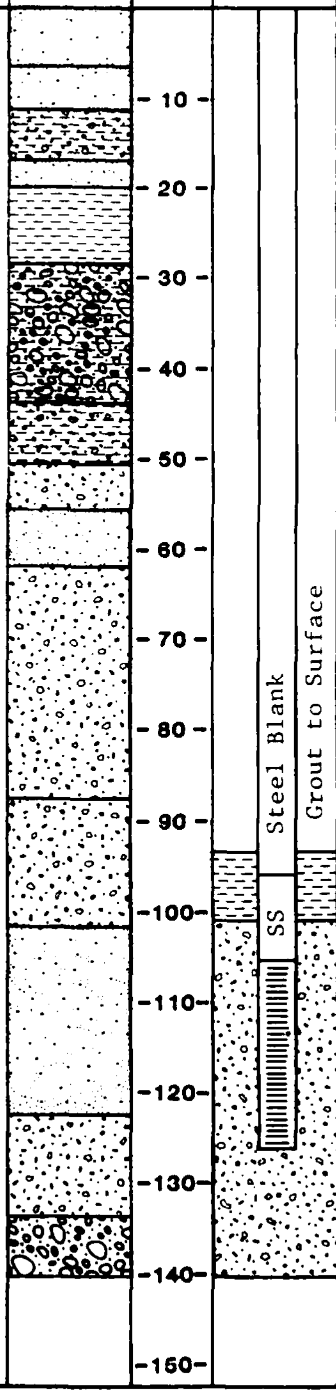
## WELL NO. 05-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #5 SR-71 Shelters **Checked By** J. Miller

**Drilling Method** Air/Water Rotary 8" **Date** 12/8/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Brown silt/sand with clay, dark brown at 5 feet with slight hydrocarbon odor. | | | | |
| Sandy silt with clay and gravel. | | | | |
| Red brown sandy clay with gravel and cobbles. | | | | |
| Light brown to buff sandy silt. | | | | |
| Soft brown clay with minor sand. | | | | |
| Clay with coarse sand and gravel. | | | | |
| Brown sand with clay, minor gravel. | | | | |
| Grey-brown medium sand and minor fine sand. | | | | |
| Moist grey-brown fine sand/silt with clay. | | | | |
| Grey-brown medium sand with some fine and coarse sand. | | | | |
| Buff brown sand ranging from fine to coarse grained. | | | | |
| Light brown fine sand and silt with increasing moisture. | | | | |
| Indurated fine sand with medium and coarse sand. Appears to be making water. | | | | |
| Gravel and sand with some clay. Sand ranges from fine to coarse. Making good water. | | | | |



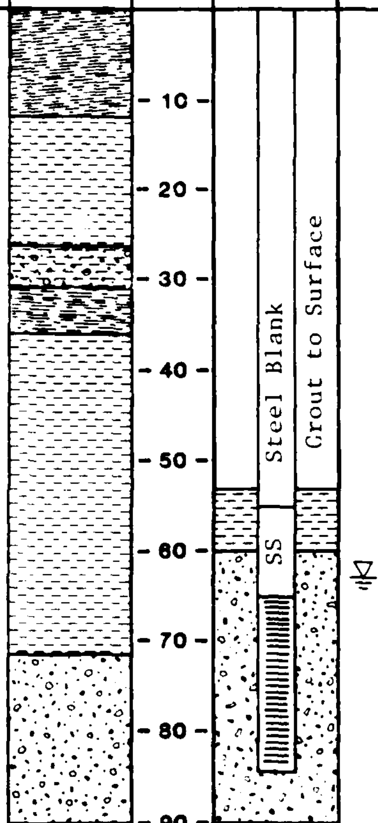
**WELL NO.** 06-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #6 Landfill #2 **Checked By** J. Miller

**Drilling Method** 8" Air/Water Rotary **Date** 11/7/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Brown clay/silt with minor sand, clay increases with depth. | | 10 | | |
| Clay with minor silt/sand, soft and brown. | | 20 | | |
| Fine to coarse sand with clay. | | 30 | | |
| Brown silt/clay with sand. | | | | |
| Clay with minor sand/silt. Silt and sand increase from 60-70 feet. | | 40 | | |
| | | 50 | | |
| | | 60 | | |
| | | 70 | | |
| Medium to coarse sand with gravel and clay. Wet. | | 80 | | |
| | | 90 | | |
| | | 100 | | |
| | | 110 | | |
| | | 120 | | |
| | | 130 | | |
| | | 140 | | |
| | | 150 | | |

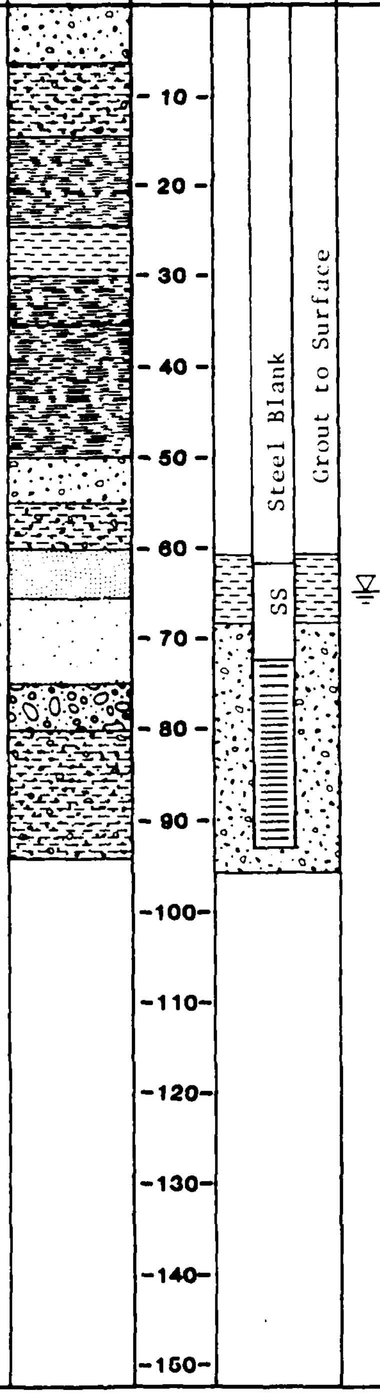


## WELL NO. 06-02

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** No. 6, Landfill No. 2 **Checked By** T. O'Gara

**Drilling Method** 8" Air Rotary/Casing Hammer **Date** 11/8/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Clayey fine sand, reddish brown.<br>Silty sand to medium sand and clay,<br>Silt and clay, red-brown.<br>Clay-brown, stiff.<br>Silt and clay, tan.<br>Silt and clay with fine sand.<br>Fine to very coarse sand with minor silt.<br>Fine to medium sand and clay.<br>Silt and medium to very coarse sand.<br>Coarse to very coarse sand and pebble gravel, red-brown.<br>Tan silty clay and medium to very coarse sand. |  | | | |





AV-F-HW04

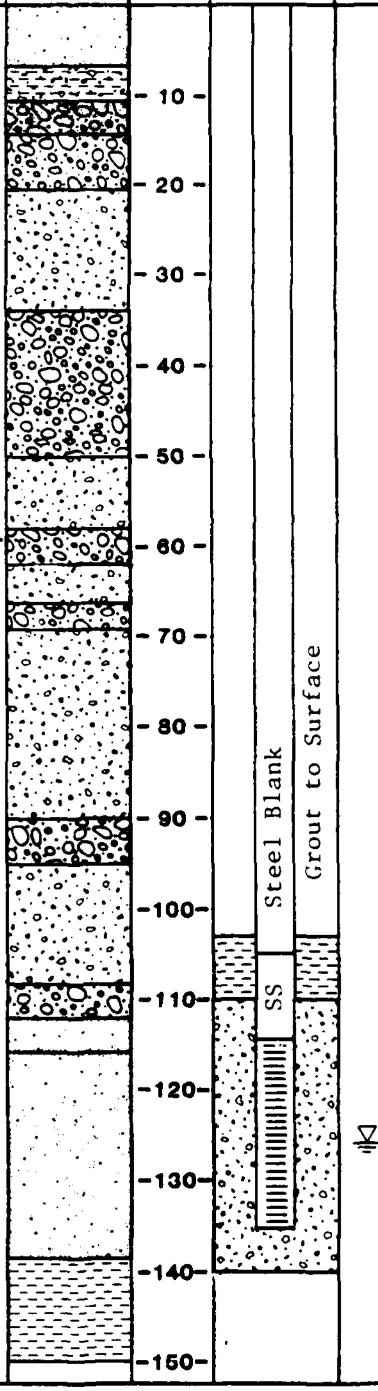
## WELL NO. 08-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #8 J-57 Test Cell **Checked By** J. Miller

**Drilling Method** 8" Air/Water Rotary **Date** 12/6/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Red brown silty sand.<br>Brown clay and sand.<br>Brown silty sand with gravel.<br>Medium sand with gravel.<br>Brown, well graded medium sand with fine sand increasing with depth.<br>Coarse sand and gravel.<br>Brown fine sand.<br>Medium to fine sand and small gravel.<br>Brown fine sand with a thin layer of coarse sand and gravel at 66-69 feet.<br>Brown fine to coarse sand with gravel and cobbles. Moisture increasing.<br>Fine sand and silt, minor medium sand.<br>Medium to coarse sand with small gravel.<br>Red/brown silt/sand.<br>Brown clay with silt and sand; sand increasing with depth.<br>Soft, plastic light tan clay. | | | | |



## WELL NO. 10-01

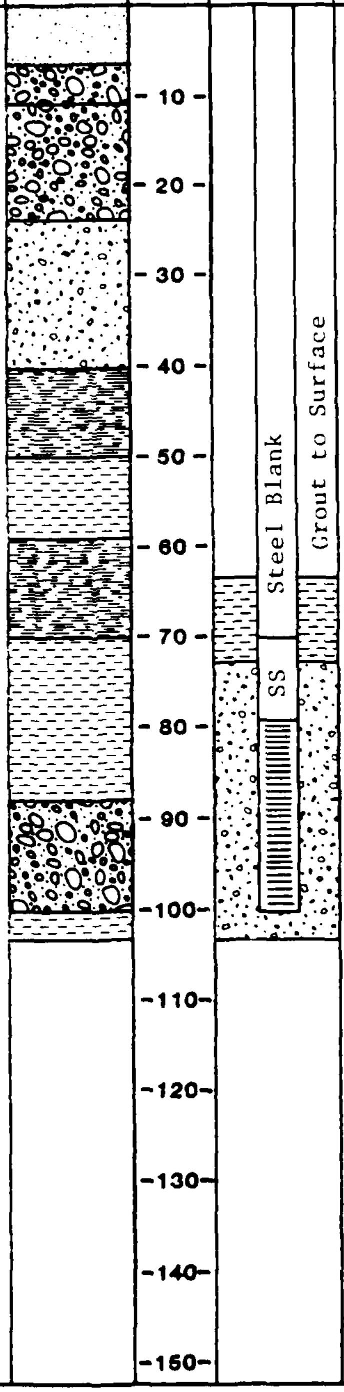
**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #10 J-58 Test Cell **Checked By** J. Miller

**Drilling Method** 8" Air/Water Rotary **Date** 12/10/85

| Geologic Description | Remarks |
|---|---|
| Brown silt and fine sand. | |
| Silt coated gravel. | |
| Fine sand with medium to coarse sand and gravel. Sand coarser towards interval bottom. | |
| Fine to medium sand with minor gravel and minor silt. | |
| Light brown/buff silt and clay; slightly moist. | |
| Clay with minor silt. | |
| Silt/clay. | |
| Beige clay becoming buff/yellow and stiff. | Possibly confined water. Note clay overlying gravel zone. Makes 2-4 GPM. |
| Black angular gravel (chert) to subangular. | |
| Clay stone. | |

Graphic Log / Depth (ft.) / Well Design



# WELL NO. 11-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** [illegible] Miller
**Site** #11 AGE Shop **Checked By** T. O'Gara
**Drilling Method** 8" Air/Water Rotary **Date** 11/21-22/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|

Silty sand to 1 foot followed by bright orange/red silt/sand/clay at 2-4 feet; probably Bc soil horizon.

Gravel and sand with large cobbles and boulders. 10-15% sand.

Thin bedded medium to coarse sand with fine sand. Thin (<1 foot) sand zones with 10-20% gravel at 29 feet, 39 feet and 45 feet.

Gravel and cobbles.

Thin medium sand layer.

Sand and gravel with small pebbles.

Medium and coarse sand with a few pebbles.

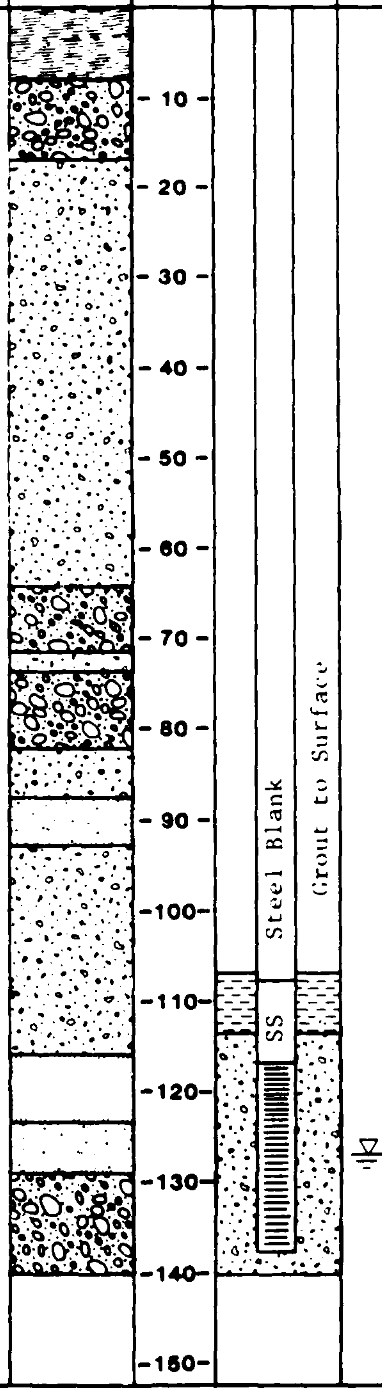
Light brown/buff/tan silty fine to medium sand.

Medium and coarse sand, minor silt slightly moist, becoming wet at 110 feet.

Silt with 20% fine sand and minor coarse sand. 6" gravel layer at 120 feet.

Medium to coarse sand with silt and 10-15% gravel. Grading into lower unit.

Excellent gravel and pebbles with coarse sand. Makes good, clean water.



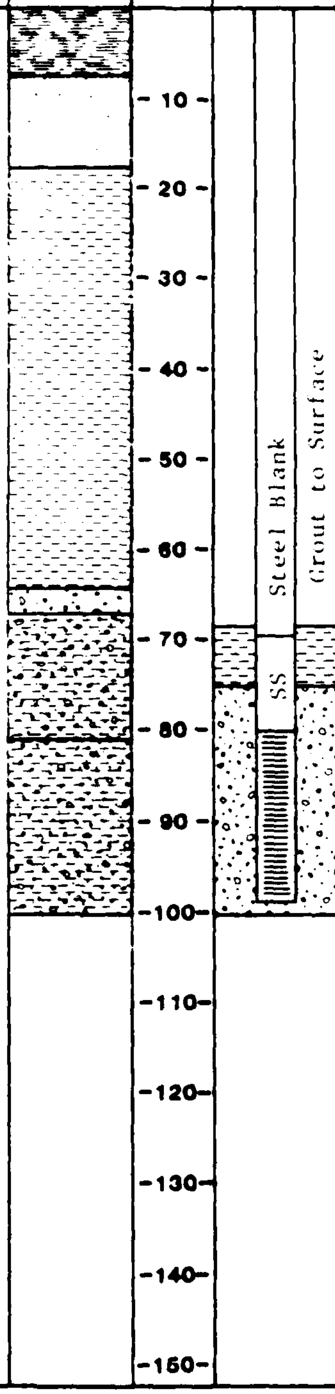
**WELL NO.** 13-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #13 Landfill #1 **Checked By** J. Miller

**Drilling Method** 8" Air/Water Rotary **Date** 11/8/85

| Geologic Description | Graphic Log / Depth (ft.) / Well Design | Remarks |
|---|---|---|
| Brown clay silt. | | |
| Brown dry silty sand. | | |
| Soft brown clay. | | |
| Fine sand with some silt. | | |
| Sandy clay. | | First completion pulled up with casing. Screen removed and hole reamed out and screen replaced. |
| Fine to medium sand with clay and silt; moist. | | |



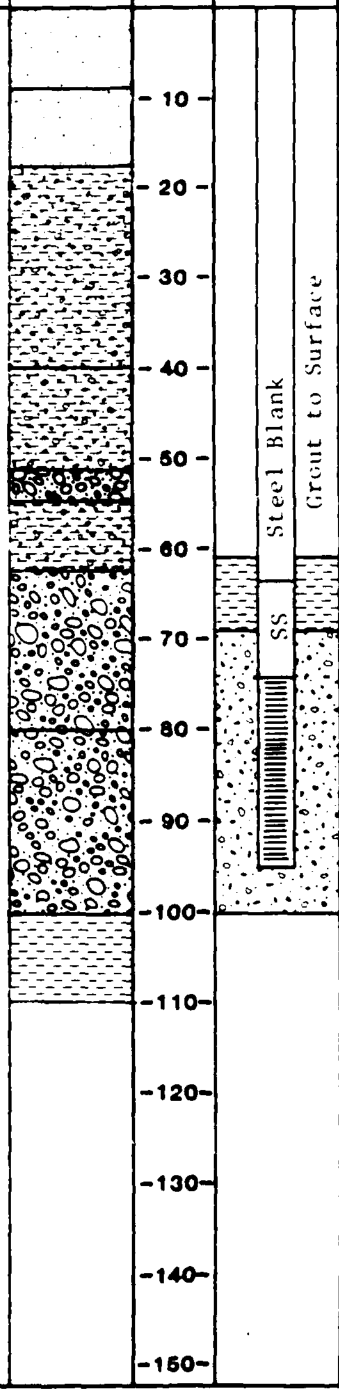
## WELL NO. 13-02

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #13 Landfill #1 **Checked By** J. Miller

**Drilling Method** 8" Air/Water Rotary **Date** 11/11/85

| Geologic Description | Graphic Log / Depth (ft.) / Well Design | Remarks |
|---|---|---|
| Brown fine to medium sand with silt, minor coarse sand and gravel. | | |
| Fine to medium sand with silt/clay, minor gravel. | | |
| Dominantly clay and medium sand, probably as thinly bedded units; minor gravel. | | |
| Clay and medium sand with silt and minor gravel. | | |
| Gravel and coarse sand. | | |
| Sandy clay with minor gravel, some reddish iron oxide staining. | | |
| Medium to coarse sand with good gravel and low amounts of silt. | | |
| As above, but silt beginning to increase. Water noted at about 82 feet. | | |
| Clay. | | |



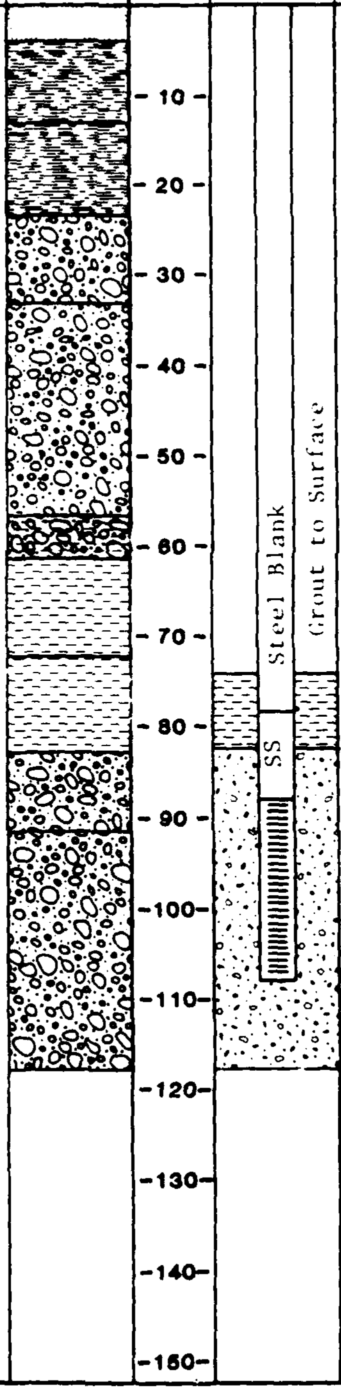
**WELL NO.** 15-01

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #15 Landfill #3 **Checked By** J. Miller

**Drilling Method** 8" Air/Water Rotary **Date** 10/28/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Red/brown silt. | | | | |
| Brown silty clay with fine sand. | | | | |
| Silty clay with fine to medium sand. | | | | |
| Gravel and coarse sand. | | | | |
| Medium to coarse sand and gravel, minor fines; fines increase near base at unit. | | | | |
| Light brown to grey clay and coarse sand and gravel. | | | | |
| Clay with much less gravel than above. | | | | |
| Stiff brown clay with minor silt and sand. | | | | |
| Fine to coarse sand and gravel with minor silt. | | | | |
| Medium to coarse sand with gravel. Brown to black gravel (chert) or volcanic fragments?; minor silt and clay. Water noted at about 99 feet. | | | | |



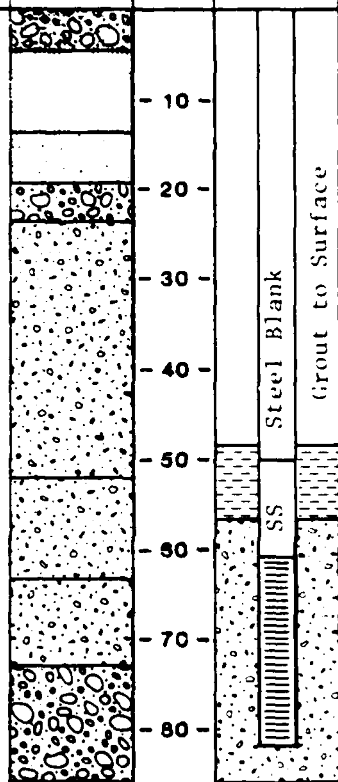
## WELL NO. 15-02

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating

**Site** #15 Landfill #3 **Checked By** J. Miller

**Drilling Method** 8" Air/Water Rotary **Date** 10/31/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Red/brown silt and gravel. | | | | |
| Red/brown silt with clay and gravel, gravel decreases with depth. | | 10 | | |
| Silty sand with minor clay, red brown. | | | | |
| Fine to coarse sand and gravel. | | 20 | | |
| Red/brown fine to medium sand with minor coarse sand and gravel at 40-45 feet. | | 30 | | |
| | | 40 | | |
| | | 50 | | |
| Silty fine sand with minor, but increasing clay with depth. | | 60 | | |
| Medium sand with minor silt; brown. | | 70 | | |
| Gravel with low amounts of sand and silt. | | 80 | | |
| | | 90 | | |
| | | 100 | | |
| | | 110 | | |
| | | 120 | | |
| | | 130 | | |
| | | 140 | | |
| | | 150 | | |

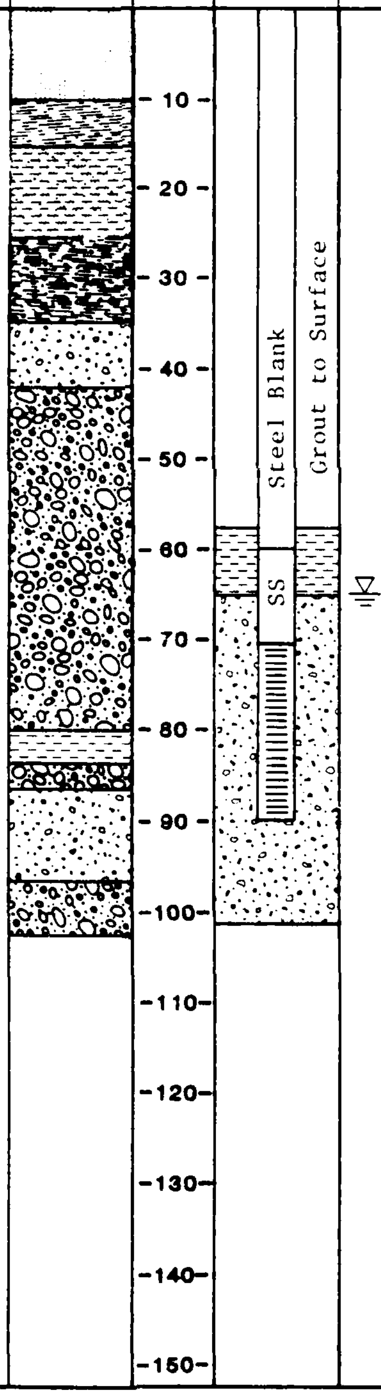


## WELL NO. 15-03

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** P. Keating/T. O'Gara

**Site** #15 Landfill #3 **Checked By** J. Miller

**Drilling Method** 8" Air/Water Rotary **Date** 11/2/85

| Geologic Description | Graphic Log | Depth (ft.) | Well Design | Remarks |
|---|---|---|---|---|
| Red brown silt and fine sand, minor clay but increasing with depth.<br>Brown silt with clay and sand.<br>Brown clay with silt/sand.<br>Sand with clay/silt and minor gravel with clay decreasing with depth.<br>Fine to coarse sand with minor clay/silt.<br>Coarse sand and gravel with lesser fine and medium sand. Gravel is subangular.<br>Thin ~2 foot clay zone.<br>Sand and gravel.<br>Fine to very coarse sand with shale fragments.<br>Silty very fine sand and gravel. |  | | | |

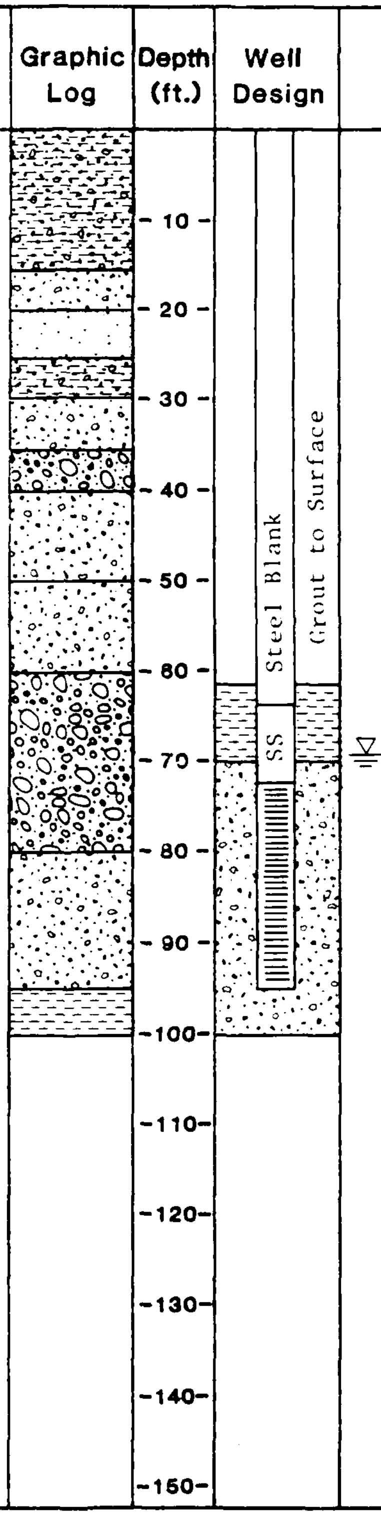
# WELL NO. 15-04

**Project Name** Beale AFB IRP **No.** 10416K **Logged By** T. O'Gara

**Site** #15 Landfill #3 **Checked By** J. Miller

**Drilling Method** 8" Air/Water Rotary **Date** 11/5/85

| Geologic Description | Remarks |
|---|---|
| Clay and medium sand with minor gravel from 10-15 feet. | |
| Coarse sand with silt/clay. | |
| Fine to medium sand with silt. | |
| Clay and sand. | |
| Fine to medium sand. | |
| Gravel with sandy clay; clay decreases with depth. | |
| Fine to medium sand with small pebble gravel. | |
| Fine to medium sand. | |
| Fine to medium sand with pebble gravel. | |
| Medium to coarse sand, wet. | |
| Dark grey shale. | |



# BORING NO. 02-01

Project Name: Beale AFB IRP — No. 10416K

Site: #2 Injection Well — Logged By: S. Thurston

No. Of Samples: 4 — Checked By: T. O'Gara

Drilling Method: 8" Hollow Stem Auger — Date: 11/12/85

| Depth (ft.) | Description | Remarks |
|---|---|---|
| | Silt and fine sand. | 02-01-S1 |
| | Clay and silt with fine sand. | |
| 5 | Fine sand and silt with minor clay. | 02-01-S2 |
| 10 | Clay with silt and fine to medium sand. | 02-01-S3 |
| | Fine to medium gravel with medium sand. | |
| 15 | Fine to medium sand with silt. | 02-01-S4 |

Columns: Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. (10 30 50) | Remarks

# BORING NO. 02-02

Project Name Beale AFB IRP  No. 10416K

Site #2 Injection Well  Logged By S. Thurston

No. Of Samples 4  Checked By T. O'Gara

Drilling Method 8" Hollow Stem Auger  Date 11/12/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Clay and silt with fine sand. | | | 02-02-S1 |
| 5 | | Clay with fine sand. | | | 02-02-S2 |
| 10 | | Hard oxidized clay, mottled. | | | 02-02-S3 |
| | | Gravel and coarse sand. | | | |
| 15 | | Clay, as above. | | | 02-02-S4 |
| | | Gravel & coarse sand (wet) | | | |
| | | Coarse sand with silt (dry). | | | |

BORING NO. 02-03

Project Name Beale AFB IRP No. 10416K

Site #2 Injection Well

No. Of Samples 4

Drilling Method 8" Auger

Logged By S. Thurston

Checked By T. O'Gara

Date 11/12/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Gravel and coarse sand. | | | 02-03-S1 |
| | | Fine to medium sand. | | | |
| 5 | | | | | 02-03-S2 |
| | | Clay and fine sand. | | | |
| 10 | | | | | 02-03-S3 |
| | | Medium sand with minor gravel. | | | |
| 15 | | | | | 02-03-S4 |
| | | Clay, reddish brown. | | | |
| 20 | | | | | |

## BORING NO. 02-04

Project Name Beale AFB IRP No. 10416K

Site #2 Injection Well

No. Of Samples 4

Drilling Method 8" Hollow Stem Auger

Logged By S. Thurston

Checked By T. O'Gara

Date 11/12/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Clay with silt and sand. | | | 02-04-S1<br>Stained black @ 1 foot.<br>OVM~9 ppm down hole. |
| 5 | | Medium to coarse sand and minor silt. | | | 02-04-S2 |
| 10 | | Medium sand and gravel with clay. | | | |
| | | Clay and medium sand with silt. | | | 02-04-S3 |
| 15 | | As above. | | | 02-04-S4 |
| 20 | | | | | |

**BORING NO.** 03-01

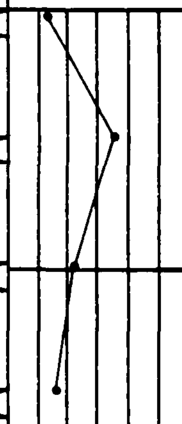
**Project Name** Beale AFB IRP **No.** 10416K

**Site** #3 Fire Protection Training Area **Logged By** D. Taylor

**No. Of Samples** 4 **Checked By** T. O'Gara

**Drilling Method** 8" Hollow Stem Auger **Date** 10/31/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Silt and clay, light brown - high root content. | | | 03-01-S1 |
| 5 | | Interbedded sand and clay, reddish to orange, clay is dense, occasional small gravel. | | | 03-01-S2<br>OVM ~1-2 ppm in hole. |
| 10 | | As above - clay is darker with some black speckling. | | | 03-01-S3 |
| 15 | | Brown clay, dense, with silt. | | | 03-01-S4<br>OVM <1 ppm. |
| | | Tan silt. | | | |
| 20 | | | | | |



**BORING NO.** 03-02

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #3 Fire Protection Training Area **Logged By** D. Taylor

**No. Of Samples** 3 **Checked By** T. O'Gara

**Drilling Method** 8" Hollow Stem Auger **Date** 10/31/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Sand and clay, reddish brown. | | | 03-02-S1 |
| 5 | | Brown sand and clay with gravel. | | | 03-02-S2 OVM ~50 ppm. Strong odor present. |
| | | Firm light brown clay, moist. | | | |
| 10 | | Clay - harder, dry. Hard, dry clay and silt with black specks. | | | 03-02-S3 OVM ~300 ppm down hole. No sign of contamination in 11 foot sample. No odor from sample. |
| 15 | | | | | |
| | | Note: First hole drilled to 4-5 feet and abandoned. Second hole drilled 6 feet west. Samples 03-02-S2 and 03-02-S3 are from second hole. | | | |

# BORING NO. 03-03

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #3 Fire Protection Training Area **Logged By** D. Taylor

**No. Of Samples** 4 **Checked By** T. O'Gara

**Drilling Method** 8" Hollow Stem Auger **Date** 10/31/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Silt and clay with roots and small brown gravel increasing clay. | | | 03-03-S1 |
| 5 | | Reddish brown clay. | | | 03-03-S2 |
| | | Light brown silt. | | | |
| 10 | | Dense brown clay with silt, some black speckling. | | | 03-03-S3 |
| 15 | | As above. | | | 03-03-S4<br>OVM <1 ppm down hole after drilling. |

## BORING NO. 03-04

Project Name Beale AFB IRP No. 10416K

Site #3 Fire Protection Training Area

Logged By D. Taylor

No. Of Samples 3

Checked By T. O'Gara

Drilling Method 8" Hollow Stem Auger

Date 10/31/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Hard pan. | | | 03-04-S1 |
| | | Silt with streaks of clay, very hard. | | | |
| 5 | | | | | 03-04-S2 |
| | | As above. | | | |
| | | Clay and silt with some black streaks, very hard. | | | |
| 10 | | | | | 03-04-S3 |
| | | Too hard to drill; hole terminated. | | | |
| 15 | | | | | |

**BORING NO.** 03-05

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #3 Fire Protection Training Area **Logged By** D. Taylor

**No. Of Samples** 3 **Checked By** T. O'Gara

**Drilling Method** 8" Hollow Stem Auger **Date** 11/1/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| 0–5 | | Medium brown clay, firm moist, some gravel. | X | | Surface sample next to tank -- no blow count. |
| 5–10 | | Green tinted silt with clay. Greenish and brown mix of clay and silt; soft. | X | | 03-05-S2 OVM readings up to 500 ppm. |
| 10–15 | | Dense medium brown clay with some black streaking. | X | | 03-05-S3 OVM 10-20 ppm in sample and 400 ppm down hole. |
| 15–20 | | Very fine sand, tan and reddish brown, lightly cemented. | X | | 03-05-S4 OVM up to 50 ppm in cuttings. |

# BORING NO. 03-06

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #3 Fire Protection Training Area

**Logged By** D. Taylor

**No. Of Samples** 4

**Checked By** J. Miller

**Drilling Method** 8" Hollow Stem Auger

**Date** 11/1/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| 5 | | Heavily stained (green) gravel and clay to 6", becoming reddish brown. | | | 03-06-S1 OVM ≥≥1000 ppm at surface. OVM ~200 ppm at 5 feet in try #2. |
| 10 | | Hard light brown clay/silt with reddish-brown and black streaks. | | | 03-06-S2 OVM ~50 ppm in sample. |
| 15 | | Slightly cemented 10-11 feet. | | | 03-06-S3 OVM ~350 ppm in sample. OVM ~120 ppm down hole. |
| 20 | | Very fine orange brown sand, soft. | | | 03-06-S4 |
| | | Note: First sample collected approximately 6 feet to the northwest. Remainder of samples and logging from try #3. | | | |

## BORING NO. 03-07

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #3 Fire Protection Training Area

**Logged By** D. Taylor

**No. Of Samples** 4

**Checked By** J. Miller

**Drilling Method** 8" Hollow Stem Auger

**Date** 11/1/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Gravel and clay, soft. | | | 03-07-S1<br>OVM ~40 ppm in sample.<br>OVM >1000 ppm in hole. |
| 5 | | Medium brown to red/brown clay/silt. | | | 03-07-S2 |
| 10 | | | | | 03-07-S3<br>OVM ~400 ppm in hole. |
| 15 | | Very fine sand, orange/ brown to tan. | | | 03-07-S4<br>OVM ~60 ppm in sample. |
| 20 | | | | | |

**BORING NO.** 03-08

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #3 Fire Protection Training Area **Logged By** D. Taylor

**No. Of Samples** 3 **Checked By** J. Miller

**Drilling Method** 8" Hollow Stem Auger **Date** 11/1/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Grey gravel and clay, hard to drill. | | | 03-08-S1<br>OVM ~40 ppm in sample. |
| 5 | | Brown, hard, dry silt/ clay, very hard to drill. | | | 03-08-S2<br>OVM >1000 ppm in hole. |
| 10 | | Hole abandoned due to difficult drilling. | | | 03-08-S3<br>OVM ~80 ppm in sample. |

**BORING NO.** 04-01

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #4 Battery Shop

**Logged By** P. Keating

**No. Of Samples** 2

**Checked By** J. Miller

**Drilling Method** 8" Auger

**Date** 10/25/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Clay/silt minor sand, grey-brown. No odor. | | | Drilled through 4" concrete at surface. |
| 5 | | Clay with silt/sand overall red/brown, no odor. | | | |
| | | Clay with sand and gravel; some silt. | | | |
| 10 | | | | | Hole abandoned at 7.5 feet when hydraulic system blew out. This hole was to be a 30 foot boring with samples at 15, 20, 25 and 30 feet. |

## BORING NO. 05-01

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #5 SR-71 Shelters **Logged By** S. Thurston

**No. Of Samples** 4 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 11/13/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Hard clay with medium to coarse sand and gravel. Brown/orange color, probably B horizon. | | | 05-01-S1 |
| 5 | | Orange/brown clay with medium to coarse sand and small gravel. Becoming very soft below 7 feet. | | | 05-01-S2<br>OVM ~4 ppm down hole. |
| 10 | | Very sandy clay with minor gravel. | | | 05-01-S3<br>OVM <1 ppm down hole. |
| 15 | | | | | 05-01-S4 |
| | | Soft wet clay with medium to coarse sand and medium to large gravel. | | | |

# BORING NO. 5-02

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #5 SR-71 Shelters **Logged By** S. Thurston

**No. Of Samples** 4 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 11/13/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Dark reddish clay and medium to coarse sand and gravel. | | | 05-02-S1 |
| 5 | | Clay and medium to coarse sand with large gravel. | | | 05-02-S2<br>OVM ~2 ppm. |
| | | As above. | | | |
| 10 | | Brown silt/clay with some gravel. | | | 05-02-S3 |
| 15 | | Coarse wet sand with clay and medium to large gravel. Overall red/brown soil. | | | 05-02-S4 |
| | | Medium sand with large gravel, minor silt and clay. Sand is white to grey. | | | |

**BORING NO.** 5-03

**Project Name** Beale AFB IRP **No.** 10416K
**Site** #5 SR-71 Shelters **Logged By** S. Thurston
**No. Of Samples** 4 **Checked By** J. Miller
**Drilling Method** 8" Auger **Date** 11/14/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Red/brown clay/silt with medium to coarse sand. | | | 05-03-S1 |
| 5 | | Dark brown silt/clay with fine sand and occasional gravel. | | | 05-03-S2 |
| 10 | | As above. | | | 05-03-S3 |
| | | Softer brown clay/silt with small gravel. | | | |
| 15 | | Hard flaky silt and fine sand with black splotches. | | | 05-03-S4 OVM >1000 ppm down hole. |

## BORING NO. 5-04

Project Name Beale AFB IRP  No. 10416K

Site #5 SR-71 Shelters  Logged By T. O'Gara

No. Of Samples 4  Checked By J. Miller

Drilling Method 8" Auger  Date 11/14/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Dark brown silt/sand with gravel<br>Gravel layer at 3-5 feet. | | | 05-04-S1 |
| 5 | | Silt/clay with minor gravel. Dark brown probably high organic matter. | | | 05-04-S2 |
| 10 | | As above but with smaller pebbles. | | | 05-04-S3 |
| 15 | | Light tan clay/silt with minimal organic matter. | | | 05-04-S4 |
| | | | | | No OVM readings recorded. |

## BORING NO. 5-05

Project Name: Beale AFB IRP  No. 10416K

Site: #5 SR-71 Shelters  Logged By: T. O'Gara

No. Of Samples: 3  Checked By: J. Miller

Drilling Method: 8" Auger  Date: 11/14/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | 0-3" moist dark silty clay - staining?<br>3-18" tan silt with minor clay. | | | 05-05-S1 |
| 5 | | Dark moist clay/silt with medium pebble gravel. | | | 05-05-S2<br>OVM ~100 ppm |
| 10 | | Very fine sand/silt with fine to medium pebble gravel. Reddish brown (stain)? | | | |
| | | Perched water<br>Large cobble halted drilling. | | | 05-05-S3<br>OVM ~700 ppm |
| 15 | | | | | |

# BORING NO. 5-06

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #5 SR-71 Shelters **Logged By** T. O'Gara

**No. Of Samples** 4 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 11/14/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Silt/clay with medium to coarse sand and cobbles. | X | | 05-06-S1<br>OVM <1 ppm on hole |
| 5 | | Silt with clay, moist and very dark with green and purple staining. | X | | 05-06-S2<br>OVM ~250 ppm from sample |
| 10 | | ⊻ Perched water at 9 feet. | | | |
| | | Fine to coarse sand and small pebble gravel. Extremely soft 12-13 feet. | X | | 05-06-S3<br>Hydrocarbons on sampler<br>OVM ~300 ppm |
| 15 | | Silty fine sand grading downwards into sandy silt at 15.5 feet +. | X | | 05-06-S4<br>OVM ~500 ppm hole<br>~1000 ppm sample |

## BORING NO. 9-01

Project Name Beale AFB IRP No. 10416K

Site #9 Entomology Shop Building 2560 Logged By P. Keating

No. Of Samples 2 Checked By J. Miller

Drilling Method 8" Auger Date 10/23/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Slightly moist brown silt with minor fine sand. | | | Background hole |
| 5 | | Coarse gravel with clay matrix and iron oxide staining. Occasional green fragments. | X | | 09-01-S1 |
| 10 | | Firm, low plastic clay with minor coarse sand and gravel. | | | |
| | | Brown, firm, silty clay with minor sand. | | | |
| 15 | | Firm silty clay with brown mottling and minor iron oxide staining. | X | | 09-01-S2 |
| | | | | | No OVM readings recorded. |

**BORING NO.** 9-02

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #9 Entomology Shop **Logged By** P. Keating

**No. Of Samples** 2 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 10/23/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Silt with sand and clay, moist brown. | | | |
| 5 | | Gravel with clay matrix. | | | |
| | | Silty sandy clay with iron oxide stain; minor gravel. Mottled. | X | | 09-02-S1 |
| 10 | | Clay with gravel. | | | |
| | | | X | | 09-02-S2<br>OVM up to 20 ppm in hole<br>OVM ~5 ppm after sampling |
| 15 | | | | | |

**BORING NO.** 09-03

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #9 Entomology Shop **Logged By** D. Taylor

**No. Of Samples** 2 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 11/1/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Grey sand and clay; fill material with sand and gravel; some black staining. | | | 09-03-S1 OVM ~6 ppm |
| 5 | | Moist red-brown soft clay. | | | 09-03-S2 OVM ~5 ppm |
| 10 | | Obstruction encountered, hole abandoned. | | | Hole drilled inside of diked area. |

**BORING NO.** 11-01

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #11 AGE Shop **Logged By** P. Keating

**No. Of Samples** 2 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 10/24/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Red brown dry silt with minor sand. | | | Background hole |
| 5 | | | | | |
| | | Clay to silt/clay with minor sand. Red-brown slightly moist. | X | | 11-01-S1 |
| 10 | | | | | |
| | | Firm, highly moist brown clay with minor silt. | | | |
| 15 | | Large cobble at 15 feet. | | | |
| | | Clay with silty sand and angular rock fragments with iron oxides. | X | | 11-01-S2 |

# BORING NO. 11-02

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #11 AGE Shop **Logged By** P. Keating

**No. Of Samples** 3 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 10/24/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| 5 | | Surface gravel underlain by brown moist clay with sand and gravel zones show black staining to 1.5 feet. | X | | 11-02-S1<br>OVM ~100 ppm hole<br>~10 ppm sample |
| 10 | | Clay to silty clay some iron oxides and organic material. No odor. Moist. | X | | 11-02-S2<br>OVM up to 40 ppm |
| 15 | | Brown moist plastic clay; minor silt and gravel grading into gravelly clay. | X | | 11-02-S3<br>OVM very low |

# BORING NO. 11-03

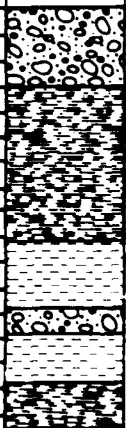
**Project Name** Beale AFB IRP **No.** 10416K

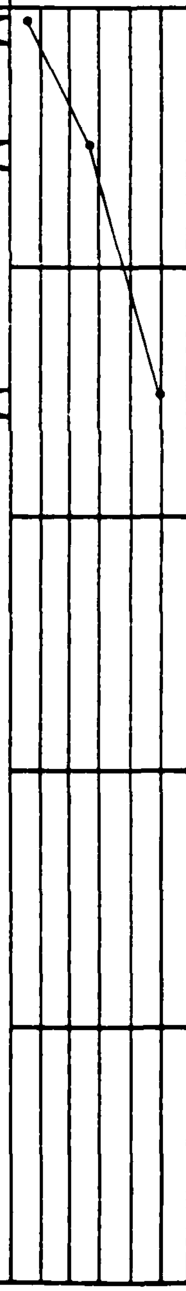
**Site** #11 AGE Shop **Logged By** P. Keating

**No. Of Samples** 3 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 10/25/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Gravel. | X | | 11-03-S1 |
| 5 | | Red brown silty clay; soft to firm and slightly moist. | X | | 11-03-S2<br>OVM ~ 30 ppm from hole. |
| 10 | | Brown soft clay, minor sand and silt. | | | |
| | | Cobble zone. | | | |
| 15 | | Brown soft clay. | | | |
| | | Red to light brown clay/silt stiff and mottled. | X | | 11-03-S3<br>OVM <1 when augers removed. |





# BORING NO. 11-04

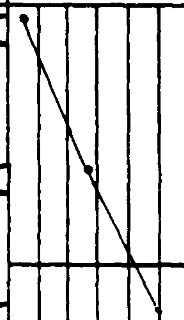
**Project Name** Beale AFB IRP **No.** 10416K

**Site** #11 AGE Shop **Logged By** P. Keating

**No. Of Samples** 3 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 10/25/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| 0–5 | | Clay rich silt with grey discoloration, slight odor. | X | | 11-04-S1<br>OVM ~250 ppm |
| 5–8 | | As above but red brown and no odor. | X | | 11-04-S2<br>OVM < 1 ppm. |
| 8–11 | | Brown clay with some silt and sand. No odor. | | | |
| 11–13 | | Clay with gravel and cobbles.<br>Too difficult to drill. | X | | 11-04-S3 |
| 15 | | | | | |



BORING NO. 12-01

Project Name Beale AFB IRP No. 10416K

Site #12 Entomology Shop Building 440 Logged By S. Thurston

No. Of Samples 3 Checked By J. Miller

Drilling Method 8" Auger Date 11/13/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Reddish fine sand with minor clay and silt. Minor gravel. | | | 12-01-S1 |
| 5 | | Dense fine sand with minor clay. Some black spots. | | | 12-01-S2<br>No significant OVM readings. |
| 10 | | Dense fine to medium sand with minor silt. | | | 12-01-S3 |

## BORING NO. 12-02

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #12 Entomology Shop Building 440 **Logged By** S. Thurston

**No. Of Samples** 3 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 11/13/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Surface soil - clay and sand with large gravel to 1 foot. | | | 12-02-S1<br>OVM <1 ppm |
| | | Fine sand and silt, reddish brown | | | |
| 5 | | Light brown fine sand and silt with clay. | | | 12-02-S2<br>OVM <1 ppm |
| 10 | | Hard, light brown fine to medium sand with silt. orange mottling common. | | | 12-02-S3<br>OVM ~14 ppm |
| 15 | | | | | |

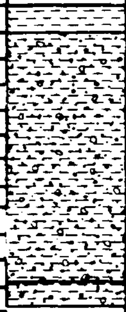
**BORING NO.** 12-03

**Project Name** Beale AFB IRP **No.** 10416K

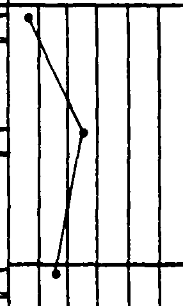
**Site** #12 Entomology Shop Building 440 **Logged By** S. Thurston

**No. Of Samples** 3 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 11/13/85



| Depth (ft.) | Description | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|
| 0 | Dark brown clay with fine sand and silt. | | 12-03-S1 OVM <1 ppm |
| 5 | Clay and fine sand with red patches. | | 12-03-S2 OVM <1 ppm |
| 10 | Medium sand with silt/clay to 11 feet. 11-15 feet clay with medium sand and silt. Red brown to light brown. | | 12-03-S3 OVM <2 ppm |
| 15 | | | |



# BORING NO. 17-01

**Project Name** Beale AFB IRP **No.** [illegible] 16K

**Site** #17 Best Slough **Logged By** J. Miller

**No. Of Samples** 2 **Checked By** D. Taylor

**Drilling Method** 8" Auger **Date** 10/22/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Red brown fine silty sand, probably good natural organics. | | | |
| 5 | | Large cobble at 6 feet. | X | | 17-01-S1<br>OVM <1 ppm |
| 10 | | ▽ Dark brown fine silty sand with moderate natural organics. Wet. | | | |
| 15 | | Coarse sand quickly grading into gravel and sand. Difficult drilling. Old stream gravels. | X | | 17-01-S2<br>OVM <1 ppm |

## BORING NO. 17-02

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #17 Best Slough **Logged By** J. Miller

**No. Of Samples** 2 **Checked By** D. Taylor

**Drilling Method** 8" Auger **Date** 10/22/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Dark brown silty, medium sand with a few cobbles. Good natural organics. | | | |
| 5 | | | X | | 17-02-S1<br>OVM <1 ppm |
| 10 | | ∇ Water table. | | | |
| 15 | | Coarse sand at 14 feet then sand and gravel (stream channel) with greenstone fragments. | X | | 17-02-S2<br>OVM <1 ppm |

## BORING NO. 17-03

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #17 Best Slough **Logged By** J. Miller

**No. Of Samples** 2 **Checked By** D. Taylor

**Drilling Method** 8" Auger **Date** 10/22/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Dark red/brown fine and medium sand with good natural organics. | | | |
| 5 | | | X | | 17-03-S1<br>OVM <1 ppm |
| 10 | | Very wet at 10 feet. | | | |
| 15 | | Coarse sand at 14 feet becoming very gravel rich at 15 feet. Greenstone rock fragments common. | X | | 17-03-S2<br>OVM <1 ppm |

## BORING NO. 17-04

Project Name: Beale AFB IRP  No.: 10416K

Site: #17 Best Slough  Logged By: J. Miller

No. Of Samples: 2  Checked By: D. Taylor

Drilling Method: 8" Auger  Date: 10/23/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| 5 | | Dark brown silty fine sand with natural organics. Occasional reddish brown medium sand layers. Good loam. Cobbles increasing below 8 feet. | | | 17-04-S1<br>OVM <1 ppm |
| 10 | | | | | |
| 15 | | Medium to coarse brown sand grading into sandy gravel and minor clay at 15 feet. | | | 17-04-S2<br>OVM <1 ppm |

**BORING NO.** 17-05

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #17 Best Slough **Logged By** J. Miller

**No. Of Samples** 2 **Checked By** D. Taylor

**Drilling Method** 8" Auger **Date** 10/23/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Dark red brown silt with low to moderate amounts of fine sand. No cobbles. Some natural organics. Possibly some thin sand layers within the silt. | | | Approx. 220 feet N15°E of sites 17-01 to 71-04. |
| 5 | | | X | | 17-05-S1 OVM <1ppm |
| 10 | | Water table | | | |
| | | Sand increases, silt decreases | | | |
| 15 | | Gravel with silt/clay | X | | 17-05-S2 OVM <1ppm |
| | | Virtually the same stratigraphy at all Best Slough sites. | | | |

## BORING NO. 17-06

Project Name Beale AFB IRP No. 10416K

Site #17 Best Slough

Logged By J.Miller

No. Of Samples 2

Checked By D. Taylor

Drilling Method 8" Auger

Date 10/23/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| 5 | | Good red/brown silty soil with about 10% fine sand and 15% clay. Minor natural organics. Good B horizon | X | | 17-06-S1 OVM <1ppm |
| 10 | | 80% clay, minor silt | | | |
| 15 | | Water table 3 feet deeper than other sites. Farther from Best Slough than other sites. | X | | 17-06-S2 OVM <1ppm |
| | | Brown medium to coarse sand with pebbles grading quickly down into gravel with sand. Rock fragments appear to be volcanic - dacite or andesite porphyry. | | | |

**BORING NO.** 18-01

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #18 Bulk Fuel Storage **Logged By** T. O'Gara

**No. Of Samples** 9 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 11/15/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Brown clay and medium sand | | | 18-01-S1 "Background Hole" |
| 5 | | Fine to medium sand with silt/clay orange color, probably B horizon | | | 18-01-S2 |
| | | | | | 18-01-S3 |
| | | Clay and silt with fine sand. Overall red/brown | | | 18-01-S4 |
| 10 | | Red/brown fine to medium sand and silt, minor gravel | | | 18-01-S5 |
| | | | | | 18-01-S6 |
| 15 | | Medium to coarse sand and gravel | | | 18-01-S7 |
| | | Stiff silt and clay | | | 18-01-S8 |
| 20 | | Compact, hard fine to medium sand | | | 18-01-S9 |
| | | | | | No OVM readings over 1 ppm. |

# BORING NO. 18-02

**Project Name** Beale AFB IRP **No.** 10416K

**Site** #18 Bulk Fuel Storage **Logged By** S. Thurston

**No. Of Samples** 9 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 11/15/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Clay with silt and sand | | | 18-02-S1 |
| | | As above but with black splotches | | | 18-02-S2 OVM <1ppm |
| 5 | | Red clay with silt and fine sand | | | 18-02-S3 |
| 10 | | Coarse sand and gravel with some silt and clay Greenish metallic splotches | | | 18-02-S4 |
| | | | | | 18-02-S5 |
| | | | | | 18-02-S6 |
| 15 | | Coarse sandy gravel with green and red splotches cemented sand in places | | | 18-02-S7 |
| | | Coarse sand and gravel with minor clay | | | 18-02-S8 |
| 20 | | Compact silt | | | 18-02-S9 |
| | | | | | All OVM readings <1 ppm. |

## BORING NO. 18-03

Project Name Beale AFB IRP No. 10416K

Site #18 Bulk Fuel Storage

Logged By S. Thurston

No. Of Samples 9

Checked By J. Miller

Drilling Method 8" Auger

Date 11/15/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Silt and fine sand with clay | | | 18-03-S1<br>No OVM Readings |
| | | Silt and very fine sand | | | 18-03-S2 |
| 5 | | Very fine sand | | | 18-03-S3 |
| | | Medium to coarse sand with some fine sand | | | 18-03-S4 |
| 10 | | | | | 18-03-S5<br>Added 5 gallons water to drill silt |
| | | Compact hard silt difficult to auger through | | | |
| 15 | | | | | 18-03-S6 |
| | | Fine to medium sand | | | 18-03-S7 |
| | | Compact silt with clay | | | 18-03-S8 |
| 20 | | | | | 18-03-S9 |

**BORING NO.** 18-04

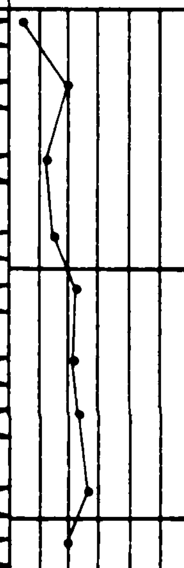
**Project Name** Beale AFB IRP **No.** 10416K

**Site** #18 Bulk Fuel Storage **Logged By** S. Thurston

**No. Of Samples** 9 **Checked By** J. Miller

**Drilling Method** 8" Auger **Date** 11/16/85

| Depth (ft.) | Graphic Log | Description | Sample Type | Blows/ft. 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Stiff clay with medium sand | | | 18-04-S1 |
| | | Fine to medium sand with minor silt, becoming siltier at base | | | 18-04-S2 |
| 5 | | | | | |
| | | Compact silt | | | 18-04-S3 |
| 10 | | | | | 18-04-S4 OVM ~2ppm in hole |
| | | Medium to very fine silt | | | 18-04-S5 |
| | | | | | 18-04-S6 |
| 15 | | Very fine sand and silt | | | 18-04-S7 7 gallon water added |
| | | Compact silt; difficult to drill; added water | | | 18-04-S8 |
| 20 | | | | | 18-04-S9 |



# APPENDIX F

## Laboratory Procedures

## F. ANALYTICAL PROCEDURES AND LABORATORY QUALITY ASSURANCE/QUALITY CONTROL

### F.1 Analytical Procedures

The following are summaries of the analytical methods employed by Acurex Analytical Laboratory in the analysis of soil and water samples collected during the investigation at Beale AFB. Unless otherwise noted, the procedures followed the referenced methods.

All analytical methods are those prescribed by the Air Force. No specific method for explosive analysis was prescribed; an appropriate method was chosen and employed.

### F.1.1 Volatile Organic Analysis, EPA 601/8010 and 602/8020

Samples were analyzed for purgeable halocarbons following EPA Method 601 for waters and Method 8010 for soils using 1% SP-1000 on Carbopack B as the primary column packing material. The method can be summarized as follows:

Helium is bubbled through 5 ml of water sample, or 5 g of soil sample dispersed in 5 ml of reagent water, contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column, packed with a methyl silicone adsorbent, tenax and coconut charcoal, where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector. The following compounds are identified based upon retention time and quantified using the three-level external standard calibration technique:

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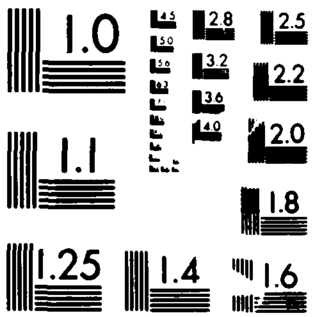
UNCLASSIFIED F33615-83-D-4000 F/G 24/4 NL




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS 1963 A

| | |
|---|---|
| Chloromethane | Bromodichloromethane |
| Bromomethane | 1,2-Dichloropropane |
| Dichlorodifluoromethane | trans-1,3-Dichloropropane |
| Vinyl chloride | TCE |
| Chloroethane | Dibromochloromethane |
| Methylene chloride | 1,1,2-Trichloroethane |
| Trichlorofluoromethane | cis-1,3-Dichloropropane |
| 1,1-DCE | Chloroethylvinyl ether |
| 1,2-DCA | Bromoform |
| trans-1,2-DCE | Tetrachloroethane |
| Chloroform | Tetrachloroethene |
| 1,2-DCA | Chlorobenzene |
| 1,1,1-TCA | Dichlorobenzenes (3 isomers) |
| Carbon tetrachloride | |

Dibromomethane was employed as a surrogate to monitor purging efficiency.

Samples were analyzed for purgeable aromatics following EPA Method 602 for waters and Method 8020 for soils using 5% SP-1200/1.75% Bentone 34 as the primary chromatographic column packing material. The method can be summarized as follows:

> Helium is bubbled through 5 ml of water sample, or 5 g of soil sample dispersed in 5 ml of reagent water, contained in a specially designed purging chamber at ambient temperature. The purgeable aromatic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column, packed with a methyl silicone adsorbent and tenax, where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeable compounds which are then detected with a photoionization detector (PID). The following compounds are identified based upon retention time and quantified using the three-level external standard calibration technique:

| | |
|---|---|
| Benzene | Chlorobenzene |
| Toluene | Xylenes (3 isomers) |
| Ethylbenzene | Dichlorobenzenes (3 isomers) |

Bromofluorobenzene was employed as a surrogate to monitor purging efficiency.

F.1.2 Oil and Grease, Total Recoverable, EPA 413.2
Petroleum Hydrocarbons, Total Recoverable, EPA 418.1

For soils, 30 grams of sample is sonicated according to EPA Method 3550 with 300 ml Freon 113. For waters, the contents of a 1-l sample bottle are checked with pH paper to verify the pH as $\leq 2$, and serially extracted three times with 60-ml aliquots of Freon 113. The sample bottle is rinsed with Freon 113, and the rinsings are added to the extract. The extract is dried using purified sodium sulfate, then scanned in the absorbance mode from 3200 $cm^{-1}$ to 2700 $cm^{-1}$ in a dual-beam infrared spectrophotometer. For petroleum hydocarbon determination, the extract is stirred with three grams silica gel to adsorb non-mineral oils and greases prior to infrared analysis. A five-level calibration curve is prepared using serial dilutions of a reference standard mixture of n-hexadecane, iso octane and chlorobenzene.

F.1.3 Metals Analysis (As, Ba, Cd, Cr, Pb, Hg, Se, Ag),
E.P. Toxicity, EPA 1310

Water samples are prepared for metals (except mercury) analysis by acidifying a 100-ml aliquot of sample with 5-ml concentrated nitric acid, evaporating the sample at 90°C down to approximately 50 ml, then adjusting the sample volume to 100 ml with deionized water. For mercury analysis, another aliquot of sample is taken and cold-digested with nitric acid.

For total soil metals analysis; five grams of soil is digested with deionized water and nitric acid. The digestate is decanted without filtering, and volume-adjusted to 100 ml.

Soil samples requiring E.P. toxicity testing are extracted for 24 hours with deionized water and adjusted to pH 5 $\pm$ 0.2 with 0.5 N acetic acid. The extract is then filtered through a 0.45 um membrane and digested in the same manner as water samples.

F.1.4 Pesticide/Herbicide Analysis, SM509A (Organochlorine Pesticides), SM 509 B (Chlorophenoxy Acid Herbicides)

Soil and water samples were anlayzed for pesticides following Method 509A and herbicides following Method 509B (Standard Methods for the Examination of Water and Wastewater, 16th edition). A 3% OV-1 column was employed as the primary column for pesticides. A 6-foot 1.5% SP-2250/1.95% SP-2401 was used as the primary column for the herbicides. Water samples for pesticide analysis were extracted with methlene chloride, solvent exchanged, concentrated, and then injected into a gas chromatograph operated isothermally.

Soil samples for pesticide analysis were sonicated in 15% methylene chloride/nexane, concentrated, and then injected into a gas chromatograph operated isothermally.

Detection of the eluting compounds were performed with an electron capture detector. Samples for herbicide analysis were extracted with diethyl ether and the extract hydrolyzed. The herbicide acids were methylated and then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of the herbicides.

F.1.5 Explosives, Analysis of Trace Amounts of Six Selected Poly-nitro Compounds in Soils American Industrial Hygiene Association Journal 45(4): 222-226 (1984)

Soil samples were prepared by extracting 10.0 grams of soil using sonication with 20.0 milliliters of acetonitrile. Extracts were clarified by centrifugation and filtration through a 0.45 um membrane. 25 µl of extract was analyzed using reverse-phase high performance liquid chromatography (HPLC) Employing a 10 micron C-18 chromatographic column. The separation was accomplished isocratically using a 40/60 methanol/water mobile phase at a flow of 2 ml/min. A UV detector set to 254 nanometers was employed for quantitation, using external standard calibration. The method analyzed for the following components: RDX (1,3,5-trinitro-1,3,5-triazacyclohexane), HMX(1,2,3,5,7-tetranitro-1,3,5,7-tetraaza-cyclooctane) and TNT (2,4,6-trinitrotoluene).

F.1.6 Phenolics, Total Recoverable, EPA 420.1

Soil samples were prepared for total phenols by forming a slurry of 20g soil in 400 ml reagent water, distilling the slurry and collecting the distillate. For water samples, 200 ml sample was distilled to remove interfering compounds.

Aliquots of the water and soil distillates were buffered to pH 10±0.2 with a buffer solution prepared with ammonium chloride and ammonium hydroxide. Aminoantipyrene and ferricyanide are added to the distillates to form a colored antipyrene complex which is measured spectrophotometrically by absorbance at 510 nm. Standards prepared from a stock phenol standard are used to create a five-point calibration curve used for sample quantitation.

F.1.7 Base/Neutrals and Acids, EPA 625

Soil and water samples were analyzed for semivolatile organics according to U.S. EPA Method 625 (Federal Register, Volume 49, No. 209, Oct. 26, 1984; page 153). The method can be summarized as follows:

> For water samples, one liter of sample is serially extracted with methylene chloride at a pH greater than 11 and again at pH less than 2. The two methylene chloride extracts are dried and each concentrated to a volume of 1 ml.
>
> For soils, a known amount of sample, approximately 30 g, is serially extracted with methylene chloride. The methylene chloride extracts are combined, dried and concentrated to a volume of 1 ml. The concentrates from both soil and water extractions are injected into a GC/MS system set specifically for the separation and measurement of the priority pollutants. Qualitative identification of the priority pollutants is performed initially using the relative retention times, the relative abundance of three characteristic ions and their ratios. The entire mass spectrum is reviewed before an identification is recorded. Quantitative analysis is performed using an internal standard with a single characteristic ion.

Prior to analysis every sample is spiked with surrogate compounds as part of Acurex's Quality Control Program. These compounds simulate the behavior of compounds of interest and confirm that acceptable recoveries are being achieved on every sample.

F.1.8 PCB Analysis, EPA 608

Soil samples were analyzed for PCBs following Methods 3550 and 608. A 3% OV-1 column was employed as the primary column. Samples were sonicated in 1:1 acetone/hexane, concentrated, and then injected into a gas chromatograph operated isothermally. Detection of the eluting compounds were performed with an electron capture detector.

F.2 Laboratory Quality Assurance Summary

The results of the laboratory's quality assurance/quality control program for the Beale AFB project are compiled in Table F-1. Laboratory duplicates and method blanks were each included at approximately 10% frequency. Matrix spikes were analyzed at 5% frequency.

The Acurex Analytical Laboratory Quality Assurance Plan is also included in this appendix.

Table F-1

602/8020 LAB DUPLICATES — PAIRED RESULTS

WATER - UG/L
SOIL - UG/G

| SAMPLE ID | TOLUENE | | | ETHYLBENZENE | | RPD | CHLOROBENZENE | | RPD | BENZENE | | RPD | XYLENES | | RPD | DICHLOROBENZENES | | RPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOIL | 0.051 | 0.034 | 40.0% | 0.056 | 0.03 | 60.5% | 0.063 | 0.032 | 65.3% | 0.013 | 0.011 | 16.7% | 0.06 | 0.011 | 138.0% | 0.07 | 0.032 | 74.5% |
| SOIL | <0.0002 | <0.0002 | | <0.0002 | <0.0002 | | <0.0002 | <0.0002 | | <0.0002 | <0.0002 | | <0.0002 | <0.0002 | | <0.0004 | <0.0004 | |
| SOIL | 0.0003 | 0.0002 | 40.0% | 0.0011 | 0.0007 | 44.4% | | | | | | | | | | | | |
| SOIL | 0.0004 | <.0002 | | 0.001 | 0.0006 | 50.0% | 0.063 | <.0002 | | | | | 0.06 | <0.0002 | | 0.07 | <0.0004 | |
| SOIL | 0.0013 | 0.0018 | 32.3% | 0.001 | 0.0006 | 50.0% | | | | 0.0003 | 0.0003 | 0.0% | | | | | | |
| SOIL | 0.0003 | 0.0006 | 66.7% | 0.0015 | 0.0029 | 63.6% | | | | <0.0002 | 0.0003 | | | | | | | |
| SOIL | 0.0005 | 0.0007 | 33.3% | 0.0002 | 0.0009 | 127.3% | <0.0002 | 0.0004 | | 0.0002 | 0.0004 | 66.7% | | | | <0.0004 | 0.0009 | |
| SOIL | 0.18 | 0.14 | 25.0% | 0.31 | 0.3 | 3.3% | | | | | | | | | | | | |
| SOIL | 0.005 | 0.0003 | 177.4% | 0.0011 | 0.0021 | 62.5% | <0.0002 | 0.0003 | | 0.003 | <0.0002 | | | | | | | |
| SOIL | 0.0005 | <.0002 | | 0.0008 | 0.001 | 22.2% | | | | 0.0002 | <0.0002 | | | | | | | |
| SOIL | 0.0003 | <.0002 | | 0.0008 | 0.0006 | 28.6% | | | | 0.0003 | <0.0002 | | | | | | | |
| SOIL | 0.0003 | <.0002 | | 0.0006 | <0.0002 | | | | | 0.0002 | <0.0002 | | | | | | | |
| SOIL | 0.0004 | 0.0005 | 22.2% | 0.0004 | 0.0006 | 40.0% | <0.0002 | 0.0003 | | <0.0002 | 0.0003 | | | | | | | |
| SOIL | 0.0003 | 0.0003 | 0.0% | 0.0003 | 0.001 | 107.7% | <0.0002 | 0.0003 | | | | | | | | | | |
| WATER | 2.8 | 3.0 | 6.9% | 2.9 | 1.4 | 66.7% | | | | | | | | | | | | |
| WATER | 2.4 | 2.6 | 8.0% | 0.4 | 0.5 | 22.2% | <0.2 | 0.2 | | 0.2 | 0.2 | 0.0% | | | | 0.4 | 0.4 | 0.0% |
| WATER | | | | 0.4 | 0.4 | 0.0% | | | | | | | | | | | | |
| WATER | 0.5 | <0.2 | | 0.6 | 0.4 | 40.0% | 0.2 | <0.2 | | 0.3 | <0.2 | | | | | | | |
| WATER | 0.2 | 0.2 | 0.0% | 0.8 | 0.8 | 0.0% | | | | 0.2 | <0.2 | | | | | | | |
| WATER | <0.2 | <0.2 | | <0.2 | <0.2 | | <0.2 | <0.2 | | <0.2 | <0.2 | | <0.2 | <0.2 | | <0.4 | <0.4 | |
| SOIL | <0.0002 | <0.0002 | | <0.0002 | <0.0002 | | <0.0002 | <0.0002 | | <0.0002 | <0.0002 | | <0.0002 | [illegible] | | <0.0004 | <0.0004 | |
| MEAN | | | [illegible] | | | [illegible] | | | | | | [illegible] | | | | | | [illegible] |
| STD DEV | | | [illegible] | | | [illegible] | | | | | | [illegible] | | | | | | [illegible] |

| 602/8020 TYPE |
|---|
| 8020 METH |
| 8020 METH |
| 8020 METH |
| 8020 METH |
| 8020 METH |
| 8020 METH |
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| 602 METHOD |
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| 602 METHOD |

METALS LAB DUPLICATES — PAIRED RESULTS

WATER - UG/L
SOIL - UG/G

| SAMPLE TYPE | As | | RPD | [illegible] | | RPD | [illegible] | | RPD | [illegible] | | RPD | [illegible] | | RPD | [illegible] | | RPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOIL | NA | NA | | NA | NA | | NA | NA | | NA | NA | | [illegible] | [illegible] | [illegible] | NA | NA | |
| SOIL | NA | NA | | NA | NA | | NA | NA | | NA | NA | | [illegible] | [illegible] | [illegible] | NA | NA | |
| SOIL | NA | NA | | NA | NA | | NA | NA | | NA | NA | | [illegible] | [illegible] | [illegible] | NA | NA | |
| SOIL | NA | NA | | NA | NA | | NA | NA | | NA | NA | | [illegible] | [illegible] | [illegible] | NA | NA | |
| SOIL | NA | NA | | NA | NA | | NA | NA | | NA | NA | | [illegible] | [illegible] | [illegible] | NA | NA | |
| SOIL | NA | NA | | NA | NA | | NA | NA | | NA | NA | | [illegible] | [illegible] | [illegible] | NA | NA | |
| WATER | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | | [illegible] | |
| SOIL | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| SOIL | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| WATER | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | | | |
| WATER | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | |
| WATER | [illegible] | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | |
| WATER | [illegible] | [illegible] | | | [illegible] | [illegible] | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | |
| WATER | [illegible] | | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | | [illegible] | [illegible] | |
| SOIL | [illegible] | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| EP LEACHATE | [illegible] | [illegible] | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | | [illegible] | |
| MEAN | | | [illegible] | | | [illegible] | | | [illegible] | | | [illegible] | | | [illegible] | | | |
| STD DEV | | | [illegible] | | | [illegible] | | | [illegible] | | | [illegible] | | | [illegible] | | | |

602/8020 LABORATORY METHOD BLANKS

602 (WATER) - UG/L
8020 (SOIL) - UG/G

| TYPE | BENZENE | TOLUENE | ETBENZ | CLBENZ | XYLENES | DICHLOROBENZENES |
|---|---|---|---|---|---|---|
| 8020 METHOD | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0004 |
| 8020 METHOD | | 0.0005 | 0.0005 | 0.0003 | | 0.0034 |
| 8020 METHOD | | 0.0003 | 0.001 | | | |
| 8020 METHOD | | 0.0004 | 0.0009 | | | |
| 8020 METHOD | | 0.0003 | 0.0001 | | | |
| 8020 METHOD | 0.0082 | 0.0005 | 0.0002 | | | |
| 8020 METHOD | | | 0.0004 | | | |
| 8020 METHOD | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0002 | <0.0004 |
| 602 METHOD | | 0.5 | 2.0 | | | |
| 602 METHOD | | 0.5 | 2.0 | | | |
| 602 METHOD | | 0.4 | 0.9 | 0.2 | | |
| 602 METHOD | | 0.4 | 0.9 | 0.2 | | |
| 602 METHOD | | | 1.1 | | | |
| 602 METHOD | | 0.3 | 1.0 | | | |
| 602 METHOD | | 0.3 | 1.0 | | | |
| 602 METHOD | | 0.3 | 0.9 | | | |
| 602 METHOD | | 0.3 | 0.9 | | | |
| 602 METHOD | 0.2 | 0.4 | 1.2 | | | |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |
| 602 METHOD | <0.2 | <0.2 | <0.2 | <0.2 | <0.2 | <0.4 |

601/8010 LABORATORY METHOD BLANKS

8010 (SOIL) - UG/G
601 (WATER) - UG/L

| TYPE | CH2CL2 | CHCL3 | 111-TCA | trans-1,2-DCE | trans-1,3-DCP | TCE | 1,1-DCE | PCE |
|---|---|---|---|---|---|---|---|---|
| 8010 METHOD | 0.0004 | 0.0003 | 0.00004 | | | | | |
| 8010 METHOD | 0.0004 | 0.0003 | 0.00004 | | | | | |
| 8010 METHOD | <0.0002 | <.00005 | <0.00003 | <0.0001 | <0.0003 | <0.0001 | <0.0001 | <0.0003 |
| 8010 METHOD | 0.0039 | | 0.00004 | 0.002 | 0.0007 | | | |
| 8010 METHOD | 0.002 | 0.0001 | | | | | | |
| 8010 METHOD | 0.0007 | | | | | | | |
| 8010 METHOD | 0.0006 | | | | | | | |
| 8010 METHOD | 0.002 | | | 0.0003 | | | | |
| 8010 METHOD | 0.0039 | 0.0004 | 0.00004 | | | | | 0.001 |
| 8010 METHOD | 0.001 | | | | | | | |
| 8010 METHOD | 0.001 | 0.001 | | | | | | |
| 8010 METHOD | 0.001 | 0.009 | | | | | | |
| 601 METHOD | 0.9 | | | | | | | |
| 8010 METHOD | 0.001 | | 0.00008 | | | | | |
| 8010 METHOD | 0.0003 | | | | | | | |
| 8010 METHOD | 0.001 | 0.00014 | | | | | 0.00001 | |
| 8010 METHOD | 0.001 | | | | | | 0.00001 | |
| 8010 METHOD | 0.002 | | | | | | 0.00002 | |
| 601 METHOD | 0.8 | | 0.37 | | | 0.3 | | |
| 601 METHOD | 0.2 | | 0.18 | | | | | |
| 601 METHOD | 1.1 | | | | | | | |
| 601 METHOD | 0.2 | | 0.18 | | | | | |
| 601 METHOD | 0.9 | | 0.13 | | | | | |
| 601 METHOD | 1.2 | | 0.18 | | | | | |
| 601 METHOD | 1.0 | | | | | | | |
| 601 METHOD | 1.7 | | | | | | | |
| 601 METHOD | 1.7 | | | | | | | |
| 601 METHOD | 1.6 | 0.37 | | | | | | |
| 601 METHOD | 1.6 | 0.14 | | | | | | |
| 601 METHOD | 1.0 | | | | | | | |
| 601 METHOD | 1.1 | 0.3 | | | | | | |
| 601 METHOD | 1.2 | | | | | | | |
| 601 METHOD | 1.7 | | | | | | | |
| 601 METHOD | 1.2 | | | | | | | |
| 601 METHOD | <1.2 | <0.05 | <0.03 | <0.1 | <0.3 | <0.1 | <0.1 | <0.2 |
| 601 METHOD | 2.0 | | | | | | | |
| 601 METHOD | 4.9 | | | | | | | |
| 8010 METHOD | 0.0010 | | | | | | | |
| 8010 METHOD | 0.0049 | | | | | | | |

BLANK ENTRIES INDICATE PARAMETER BELOW METHOD DETECTION LIMIT

| | Hg | RPD | Se | RPD | Ag | RPD |
|---|---|---|---|---|---|---|
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | |
| | | | [illegible] | [illegible] | [illegible] | [illegible] |
| | | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] | [illegible] |
| | | | [illegible] | [illegible] | 0.2 | 0.2 |
| | | | [illegible] | [illegible] | <10 | [illegible] |
| | | | [illegible] | [illegible] | 10 | [illegible] |
| | | | [illegible] | [illegible] | [illegible] | [illegible] |
| | | | [illegible] | [illegible] | <10 | 10 |
| | | | [illegible] | [illegible] | 10 | 10 |
| | | | [illegible] | [illegible] | [illegible] | [illegible] | 0.0% |
| | | | [illegible] | [illegible] | [illegible] | [illegible] |

25.0%
25.[illegible]%

OIL & GREASE LAB DUPLICATES — WATER - MG/L, SOIL - UG/G

PAIRED RESULTS

| SAMPLE TYPE | OIL & GREASE | | RPD |
|---|---|---|---|
| SOIL | 65.0 | 7000 | 7.4% |
| SOIL | <100 | <100 | |
| SOIL | <100 | <100 | |
| SOIL | <100 | <100 | |
| SOIL | <100 | <100 | |
| SOIL | 8.0 | 700 | [illegible] |
| SOIL | 300 | 500 | 50.0% |
| SOIL | 100 | <100 | |
| SOIL | <100 | <100 | |
| SOIL | <100 | <100 | |
| SOIL | 1000 | 1400 | 33.3% |
| SOIL | 1300 | 1300 | 0.0% |
| SOIL | 19000 | 33000 | 53.8% |
| SOIL | <100 | <100 | |
| WATER | 8.3 | 1.5 | 138.8% |
| SOIL | 1300 | 600 | 73.7% |
| SOIL | 1400 | 1600 | 13.3% |
| MEAN | | | 42.6% |
| STD DEV | | | 41.3% |

TOTAL PHENOLICS DUPLICATES — WATER - UG/L, SOIL - UG/G

PAIRED RESULTS

| SAMPLE TYPE | PHENOLS | | RPD |
|---|---|---|---|
| SOIL | <1 | <1 | |
| SOIL | <1 | <1 | |
| SOIL | <1 | <1 | |
| SOIL | 1 | <1 | |
| SOIL | <1 | <1 | |
| SOIL | <1 | <1 | |
| SOIL | 1 | <1 | |
| SOIL | 1 | 1 | |
| WATER | 4 | 3 | 28.6% |
| WATER | 19 | 17 | 11.1% |
| SOIL | 2 | 2 | 0.0% |
| SOIL | <1 | <1 | |
| WATER | 2 | <1 | |
| SOIL | <1 | <1 | |
| SOIL | <1 | <1 | |
| WATER | <1 | <1 | |
| WATER | 1 | <1 | |
| WATER | 21 | 23 | [illegible] |
| WATER | 14 | 16 | 13.3% |
| WATER | 2 | 3 | 40.0% |
| WATER | <1 | <1 | |
| WATER | 8 | 6 | [illegible] |
| WATER | 10 | 9 | 10.5% |
| WATER | 37 | 37 | 0.0% |
| SOIL | <1 | <1 | |
| MEAN | | | 13.6% |
| STD DEV | | | 12.9% |

## Table F-1 (Cont.)

601/8010 LAB DUPLICATES

WATER - UG/L
SOIL - UG/G

| SAMPLE TYPE | PAIRED RESULTS CH2CL2 | | RPD | CHLOROFORM | | RPD | TCE | | RPD | TRANS-1,2-DCE | | PERCHLOROETHYLENE | | RPD | 1,2-DCP |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| SOIL | 0.011 | 0.03300 | 100.0% | 0.003 | 0.006 | 66.7% | 0.002 | 0.003 | 40.0% | 0.0001 | 0.0002 | | | | |
| SOIL | 0.009 | 0.01700 | 72.0% | <.00005 | 0.002 | | 0.009 | 0.01 | 10.5% | <0.0001 | 0.0001 | 0.002 | 0.002 | 0.0% | |
| SOIL | 0.005 | 0.00600 | 18.2% | 0.0007 | 0.0005 | 33.3% | 0.0007 | 0.0009 | 25.0% | <0.0001 | 0.0001 | | | | |
| SOIL | 0.011 | 0.00500 | 75.0% | 0.004 | 0.001 | 120.0% | 0.002 | 0.025 | 170.4% | 0.0001 | 0.014 | 0.0006 | 0.002 | 07.7% | |
| SOIL | 0.011 | 0.00400 | 93.3% | 0.002 | 0.001 | 66.7% | 0.015 | 0.021 | 33.3% | 0.001 | 0.003 | 0.0003 | <.0003 | | |
| SOIL | 0.002 | 0.00100 | 66.7% | 0.0002 | 0.0003 | 40.0% | | | | | | | | | |
| SOIL | 0.004 | 0.004 | 0.0% | 0.001 | 0.0005 | 66.7% | | | | | | | | | |
| SOIL | 0.002 | 0.002 | 0.0% | 0.001 | 0.0003 | 107.7% | | | | <0.0001 | 0.0001 | | | | |
| SOIL | 0.003 | 0.004 | 28.6% | 0.0009 | 0.0003 | 100.0% | | | | | | | | | |
| SOIL | 0.002 | 0.005 | 85.7% | <0.00005 | 0.00048 | | | | | | | | | | |
| SOIL | 0.002 | 0.002 | 0.0% | | | | | | | | | | | | |
| SOIL | 0.003 | 0.003 | 0.0% | 0.00007 | 0.00007 | 0.0% | | | | | | | | | |
| SOIL | 0.007 | 0.004 | 54.5% | 0.00007 | 0.00007 | 0.0% | | | | | | | | | |
| WATER | 1.0 | 0.9 | 10.5% | | | | 0.2 | 0.2 | 0.0% | | | | | | |
| WATER | 6.2 | 0.8 | 154.3% | | | | | | | | | | | | |
| WATER | 0.8 | 0.6 | 28.6% | | | | | | | | | | | | |
| WATER | 1.1 | 0.6 | 58.8% | | | | | | | | | | | | |
| WATER | 2 | 2.4 | 18.2% | 0.46 | 0.33 | 32.9% | 1.3 | 1.3 | 0.0% | 11 | 9.8 | 8.3 | 8.4 | 1.2% | 0.47 |
| WATER | 2.3 | <0.2 | | | | | 90 | 100 | 10.5% | 1.7 | 1.1 | | | | |
| WATER | 3.3 | 2 | 49.1% | | | | | | | | | | | | |
| WATER | 160 | <5 | | | | | | | | | | | | | |
| SOIL | 0.0036 | 0.0017 | 71.7% | | | | 0.0002 | <0.0001 | | | | | | | |
| SOIL | 0.0047 | 0.0009 | 135.7% | 0.00007 | 0.00009 | 25.0% | 0.0002 | <0.0001 | | | | | | | |
| MEAN | | | 53.37% | | | 54.91% | | | 36.22% | | | | | 36.30% | |
| STD DEV | | | 43.70% | | | 38.26% | | | 52.55% | | | | | 50.49% | |

509A LAB DUPLICATES
PAIRED RESULTS

WATER - UG/L
SOIL - UG/G

| SAMPLE TYPE | CHLORDANE | | RPD | TOXAPHENE | | LINDANE | | RPD | |
|---|---|---|---|---|---|---|---|---|---|
| SOIL | 1.6 | 0.9 | 56.0% | <0.2 | <0.2 | <0.008 | <0.008 | | ALL OTHER COMPOUNDS ND |
| SOIL | <0.08 | <0.08 | | <0.2 | <0.2 | <0.008 | <0.008 | | ALL OTHER COMPOUNDS ND |
| SOIL | <0.08 | <0.08 | | <0.2 | <0.2 | <0.008 | <0.008 | | ALL OTHER COMPOUNDS ND |
| WATER | <0.50 | <0.50 | | 0.13 | <1.0 | <0.01 | 0.09 | | ALL OTHER COMPOUNDS ND |
| SOIL | <0.08 | <0.08 | | <0.2 | <0.2 | <0.008 | <0.008 | | ALL OTHER COMPOUNDS ND |
| WATER | <0.50 | <0.50 | | <1.0 | <1.0 | 0.5 | 0.01 | 192.2% | ALL OTHER COMPOUNDS ND |

509B LAB DUPLICATES
PAIRED RESULTS

WATER - UG/L
SOIL - UG/G

| SAMPLE TYPE | 2,4-D | | RPD | 2,4,5-T | | RPD | SILVEX | | RPD |
|---|---|---|---|---|---|---|---|---|---|
| SOIL | <0.3 | <0.3 | | <0.1 | <0.1 | | <0.1 | <0.1 | |
| WATER | <0.6 | <0.6 | | <0.6 | <0.6 | | <0.6 | <0.6 | |
| WATER | <0.6 | <0.6 | | <0.6 | <0.6 | | <0.6 | <0.6 | |
| WATER | <0.6 | <0.6 | | <0.6 | <0.6 | | 0.09 | 0.07 | |

METALS LABORATORY METHOD BLANKS

| TYPE | As | Ba | Cd | Cr | Pb | - |
|---|---|---|---|---|---|---|
| SOIL | NA | NA | NA | NA | <1 | N |
| SOIL | NA | NA | NA | NA | <1 | N |
| SOIL | NA | NA | NA | NA | <1 | N |
| SOIL | NA | NA | NA | NA | <1 | N |
| SOIL | NA | NA | NA | NA | <1 | N |
| WATER | <10 | <60 | <10 | <10 | <20 | |
| SOIL | <0.2 | <1 | <0.2 | <0.2 | <1 | <0 |
| SOIL | NA | NA | NA | NA | <1 | N |
| WATER | <10 | <60 | <10 | <10 | <10 | |
| SOIL | <0.2 | <1 | <0.2 | <0.2 | <1 | <0 |
| WATER | <10 | <50 | <10 | <10 | <20 | |
| WATER | NA | NA | NA | NA | <20 | N |
| WATER | <10 | <50 | <10 | <10 | <20 | |
| WATER | NA | NA | NA | NA | <20 | N |
| WATER | <10 | <50 | <10 | <10 | <20 | |
| WATER | <10 | <50 | <10 | <10 | <20 | |
| WATER | NA | NA | NA | NA | <20 | N |
| WATER | <10 | <50 | <10 | <18 | <20 | |
| WATER | NA | NA | NA | NA | <20 | N |
| WATER | <10 | <40 | <10 | <10 | <20 | |
| WATER | <10 | <40 | <10 | <10 | <20 | |
| WATER | <10 | 50 | <10 | <10 | <20 | |
| WATER | <10 | <40 | <10 | <10 | <20 | |
| WATER | <10 | <50 | <10 | <10 | <20 | |
| SOIL | <0.2 | <1 | <0.2 | <0.2 | <0.4 | <0 |

NA - PARAMETER NOT ANALYZED FOR

PETROLEUM HYDROCARBONS LAB DUPLICATES
PAIRED RESULTS

WATER - MG/L
SOIL - UG/G

| SAMPLE TYPE | PET HYDROCARBONS | | RPD |
|---|---|---|---|
| SOIL | <100 | <100 | |
| SOIL | <100 | <100 | |
| SOIL | <100 | <100 | |
| SOIL | <100 | <100 | |
| SOIL | <100 | <100 | |
| WATER | 5.2 | 1.3 | 120.0% |

HERBICIDE (509B) LABORATORY METHOD BLANKS

| TYPE | QTY | |
|---|---|---|
| SOIL | 6 | NO COMPOUNDS ABOVE METHOD DETECTION LIMIT |
| WATER | 1 | NO COMPOUNDS ABOVE METHOD DETECTION LIMIT |

| | NE RPD | 1,2-DCP | | RPD | 1,1-DCE | | RPD | 1,1,1-TCA | | RPD | CHLOROBENZENE | | RPD | DICHLOROBENZENES | | RPD |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | | | 0.0001 | 0.0001 | 0.0% | 0.0003 | 0.000[illegible] | 50.0% | | | |
| 02 | 0.0% | | | | | | | 0.0001 | 0.00003 | 107.7% | | | | | | |
| 02 | 07.7% | | | | | | | | | | | | | 0.0007 | <0.0003 | |
| 03 | | | | | | | | 0.0001 | 0.0001 | 0.0% | | | | 0.013 | 0.033 | 87.0% |
| | | | | | | | | | | | | | | 0.0007 | 0.0009 | 13.3% |
| | | | | | | | | | | | | | | 0.0008 | <0.0003 | |
| | | | | | 0.0002 | <0.0001 | | 0.0001 | 0.00004 | 85.7% | | | | | | |
| | | | | | 0.0002 | 0.0003 | 40.0% | 0.0001 | <0.00003 | | | | | | | |
| | | | | | 0.00029 | <0.0001 | | <0.00003 | 0.00004 | | | | | | | |
| | | | | | 0.0002 | 0.0002 | 0.0% | 0.0002 | 0.00016 | 22.2% | | | | <0.0003 | 0.0002 | |
| | | | | | | | | 0.69 | 0.08 | 152.4% | | | | | | |
| | | | | | | | | 0.11 | <0.03 | | 0.3 | <0.2 | | | | |
| 8.4 | 1.2% | 0.47 | 0.41 | [illegible].6% | | | | | | | | | | | | |
| | | | | | | | | 0.00004 | <.00003 | | | | | | | |
| | [illegible].3[illegible]% | | | | | | | | | 62.35% | | | | | | 50.14% |
| | [illegible].47% | | | | | | | | | 59.47% | | | | | | 36.81% |

| Cr | Pb | Hg | Se | Ag |
|---|---|---|---|---|
| NA | <1 | NA | NA | NA |
| NA | <1 | NA | NA | NA |
| NA | <1 | NA | NA | NA |
| NA | <1 | NA | NA | NA |
| NA | <1 | NA | NA | NA |
| <10 | <20 | <1 | <10 | <10 |
| <0.2 | <1 | <0.05 | <0.2 | <0.2 |
| NA | <1 | NA | NA | NA |
| <10 | <10 | <1 | <10 | <10 |
| <0.2 | <1 | <0.05 | <0.2 | <0.2 |
| <10 | <20 | <1 | <10 | <10 |
| NA | <20 | NA | NA | NA |
| <10 | <20 | <1 | <10 | <10 |
| NA | <20 | NA | NA | NA |
| <10 | <20 | <1 | <10 | <10 |
| [illegible] | <20 | <1 | <10 | <10 |
| NA | <20 | NA | NA | NA |
| [illegible] | <20 | <1 | <10 | <10 |
| NA | <20 | NA | NA | NA |
| [illegible] | <20 | <1 | <20 | <10 |
| [illegible] | <20 | <1 | <20 | <10 |
| [illegible] | <20 | <1 | <20 | <10 |
| [illegible] | <20 | <1 | <20 | <10 |
| [illegible] | <20 | <1 | <10 | <10 |
| [illegible] | <0.4 | <0.05 | <0.2 | <0.2 |

OIL AND GREASE LABORATORY METHOD BLANKS

| TYPE | | O&G |
|---|---|---|
| SOIL | | <100 |
| SOIL | | <100 |
| SOIL | | <100 |
| SOIL | | <100 |
| SOIL | | <100 |
| WATER | | <0.1 |
| SOIL | | <100 |
| WATER | WATER - MG/L | <0.1 |
| SOIL | SOIL - UG/G | <100 |
| WATER | | 0.2 |
| WATER | | 0.2 |
| WATER | | 0.2 |
| WATER | | 0.2 |
| WATER | | 0.2 |
| WATER | | 0.6 |
| WATER | | 1.0 |
| WATER | | 0.1 |

PCB DUPLICATES
PAIRED RESULTS

WATER - UG/L
SOIL - UG/G

| SAMPLE ID | | PCB | | RPD |
|---|---|---|---|---|
| SOIL | * | 5.3 | 7.4 | 33.1% |

* AROCLOR 1260

PESTICIDE (509A) LABORATORY METHOD BLANKS

| TYPE | QTY | |
|---|---|---|
| SOIL | 6 | NO COMPOUNDS ABOVE METHOD DETECTION LIMIT |
| WATER | 4 | NO COMPOUNDS ABOVE METHOD DETECTION LIMIT |

PETROLEUM HYDROCARBONS LABORATORY METHOD BLANKS

| TYPE | O&G | |
|---|---|---|
| SOIL | <100 | |
| SOIL | <100 | |
| SOIL | <100 | |
| SOIL | <100 | WATER - UG/L |
| WATER | <0.1 | SOIL - UG/G |
| WATER | <0.1 | |
| WATER | 0.2 | |
| WATER | 0.2 | |
| WATER | 0.5 | |
| WATER | 0.8 | |
| WATER | <0.1 | |

RPD = RELATIVE PERCENT DIFFERENCE = $\frac{I1 - I2}{\frac{I1 + I2}{2}} \times 100\%$

# QUALITY ASSURANCE PLAN
# FOR
# ACUREX LABORATORY
# (ORGANIC ANALYSES)

For

Department of Health Services
State of California
Berkeley, California 94704

By

Acurex Corporation
Energy & Environmental Division
485 Clyde Avenue
P.O. Box 7044
Mountain View, California 94039

F-11.

# QUALITY ASSURANCE PLAN

FOR

ACUREX LABORATORY
(ORGANIC ANALYSES)

Approved by:

Acting Laboratory Director: Jim Thompson 1/14/86
Jim Thompson — Date

GC/MS Group Leader: Viorica Lopez-Avila 1/14/86
Viorica Lopez-Avila — Date

Manager of GC/MS Operations: Richard Scott 1/14/86
Richard Scott — Date

Acurex Quality Assurance Representative: Greg Nicoll Jan. 14 1986
Greg Nicoll — Date

CONTENTS

Personnel Receiving Copies of Approved Quality Assurance Plan

| Project Responsibility | Name |
|---|---|
| GC/MS Group Leader | Viorica Lopez-Avila |
| Manager of GC/MS Operations | Richard Scott |
| GC Operations | Sarah Schoen |
| GC/MS Operations | Sue Kraska |
| Sample Control Custodian | Efren Sablan |
| QA Representative | Greg Nicoll |

# 1. INTRODUCTION

The purpose of this Quality Assurance Plan is to describe the procedures that are used to assure the degree of quality of organic analyses. While this Quality Assurance plan is in EPA format, it is applicable to organic analysis as approved by the State of Caifornia Department of Health Services.

## 2.3 Project Description

The purpose of this project is to provide quantitative organic analyses on water, wastewater, sludge, soil, sediment, and air samples. Specifically, the following methods will be used for waters, soil, liquid wastes, solid wastes, and air samples are presented in Table 2.3-1.

Table 2.3-1. Methods Recommended for the Analysis of Organic Compounds in Water, Soil, Liquid Waste, Solid Waste, and Air Samples

| Compound Class | Water[a] | Soil[b], Liquid, or Solid Waste | Air[c] |
|---|---|---|---|
| Phenols | 604,625 | 8040,8270 | |
| Nitrosamines | 607 | 8070,8270 | |
| Purgeable halocarbons | 601,624 | 8010,8240 | |
| Purgeable aromatics | 602,624 | 8020,8240 | |
| Pesticides, PCBs | 608,625 | 8080,8270 | |
| Polynuclear aromatic hydrocarbons | 610 | 8310 | |
| Pugeables PP volatile organics | 624 | 8240 | |
| Semivolatile PP BNA | 625 | 8270 | |
| Chlorophenoxy acid herbicides | 615 | 8150 | |
| Organophosphate pesticides | 614 | 8140 | |
| Nonhalogenated volatile organics | | 8015 | |
| Acrolein, acrylonitrile | 603 | 8030 | |
| Phthalate esters | 606 | 8060 | |
| Nitroaromatics | 609 | 8090 | |
| Chlorinated hydrocarbons | 612 | 8120 | |

[a]See Federal Register 40 CFR Part 136, October 26, 1984, for complete details of water mthods

[b]See Test Methods for Evaluating Solid Wastes SW-846, Second Edition for complete details of methods

[c]Methods for air analysis are referenced in "Methods of Air Sampling and Analysis, 2nd Edition, APHA 1977, NIOSH Manual of Analytical Methods, 2nd Edition 1977 and Quality Assurance Handbook for Air Pollution Measurements, Vol II, Ambient Air Specific Methods, U.S. EPA-600/4-77-027, May 1977

## 2.4 Project Organization and Responsibility

The acting laboratory director is Jim Thompson. Dr. Viorica Lopez-Avila will manage the project. Richard Scott will be responsible for all GC/MS analyses and Dr. Sarah Schoen will be responsible for all GC analyses. The sample custodian, who is also responsible for tracking all samples, is Efren Gablan. The QA representative is Greg Nicoll, and he will approve procedures and review quality assurance data.

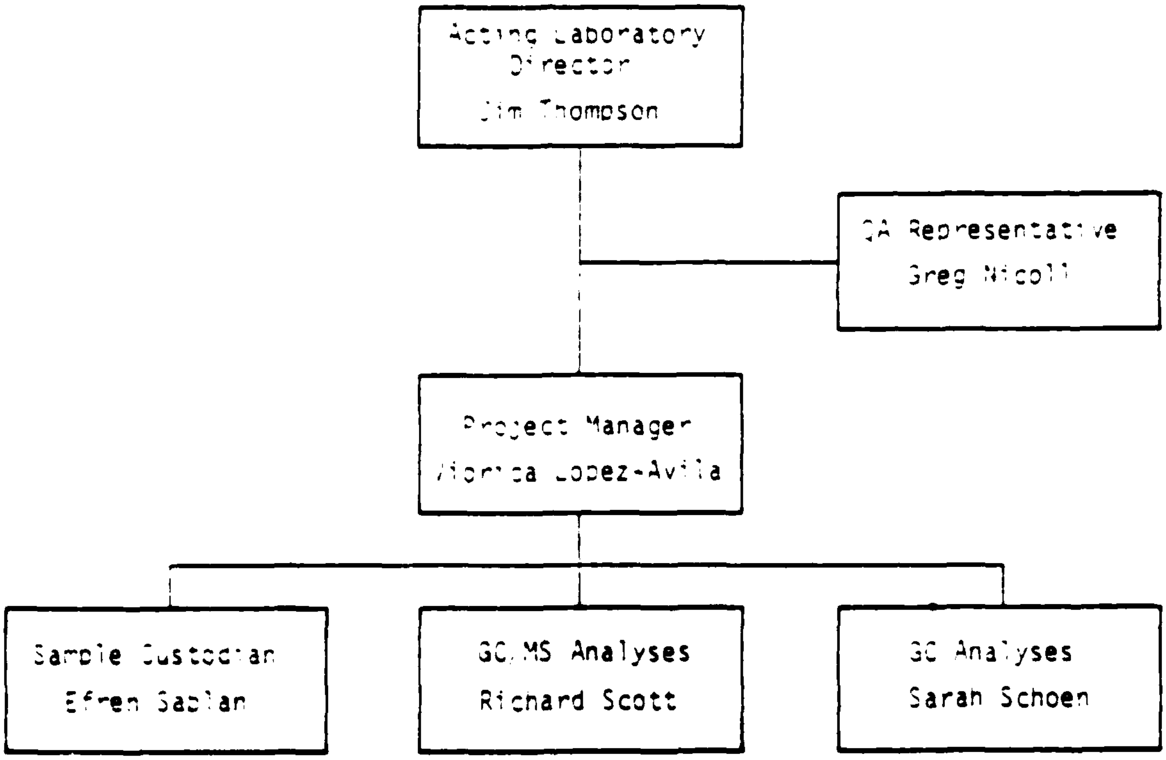




Figure 2.4-1. Project Organization

## 2.5 QA Objectives for Measurement Data in Terms of Precision, Accuracy, and Completeness

The QA goals are summarized in Table 2.5-1.

- The method(s) precision (percent RSD) will be determined from duplicate analysis. At least one sample in a batch of ten will be analyzed in duplicate. Analysis shall meet the criteria in Table 2.5-1 for precision.
- The method accuracy for water and soil samples will be determined by spiking selected samples with compounds listed in Table 2.5-2. Accuracy will be reported as the percent recovery of the test compound and shall meet the criteria given in Table 2.5-1.
- Completeness (percent) will be assessed as valid sample data (VSD) divided by total expected sample data (TSD) times 100, i.e.;

$$\frac{VSD}{TSD} \times 100$$

Analysis shall meet the criteria in Table 2.5-1 for completeness.

Table 2.5-1. Summary of Objectives for Precision and Accuracy

| | |
|---|---|
| **Precision** | Maximum Acceptable Percent of Difference Between Duplicate Analyses (percent) |
| Volatile | 15 |
| Base/Neutral | 50 |
| Acid | 40 |
| Pesticides | 40 |
| **Accuracy** | |
| Water Samples Matrix Spikes | Acceptable Range of Recovery (percent) |
| Pesticides | 40 to 130 |
| Volatiles | 60 to 145 |
| Base/neutrals | 30 to 120 |
| Acids | 10 to 120 |
| Water Samples Surrogate Spikes | Acceptable Range of Recovery (percent) |
| Volatiles | 80 to 120 |
| Base/neutrals | 30 to 130 |
| Acids | 15 to 110 |
| Pesticides | 70 to 120 |
| TCDD | 20 to 150 |
| Soil/Waste Samples Matrix Spikes | Acceptable Range of Recovery (percent) |
| Pesticides | 25 to 140 |
| Volatiles | 60 to 140 |
| Base/neutrals | 30 to 140 |
| Acids | 20 to 120 |
| Soil/Waste Samples Surrogate Spikes | Acceptable Range of Recovery (percent) |
| Pesticides | 25 to 140 |
| Volatiles | 60 to 130 |
| Base/neutrals | 25 to 120 |
| Acids | 15 to 110 |
| Completeness | >90 percent |

## 2.6 Sampling Procedures

Sample containers will be cleaned according to the type of analysis required. Standard Operating Procedures describe the cleaning methods for each bottle code. Sample preservatives and holding time per parameter are shown in Table 2.6-1.

Table 2.6-1. Preservation and Holding Times for Samples

| Parameter | Bottle Code | Preservation | Holding Time |
|---|---|---|---|
| Purgeable halocarbons | Glass, teflon-lined septum | Cool, 4°C 0.008 percent $Na_2S_2O_3$ | 14 days |
| Purgeable aromatics | Glass, teflon-lined septum | Cool, 4°C 0.008 percent, $Na_2S_2O_3$ Adjust pH 1 to 2 | 14 days |
| Acrolein, acrylonitrile | Glass, teflon-lined septum | Cool, 4°C 0.008 percent, $Na_2S_2O_3$ Adjust pH 4 to 5 | 14 days |
| Phenols | Glass, amber | Cool, 4°C | 7 days until extraction |
| Semivolatiles (BNA) | Glass, amber | Cool, 4°C | 7 days until extraction |
| Pesticides and PCBs | Glass, amber | Cool, 4°C Adjust pH 5 to 9 | 7 days until extraction |
| Nitrosamines | Glass, amber | Cool, 4°C 0.008 percent $Na_2S_2O_3$ | 7 days until extraction |
| Polynuclear aromatic hydrocarbons | Glass, amber | Cool, 4°C | 7 days until extraction |
| Chlorophenoxy acid herbicides | Glass, amber | Cool, 4°C | 7 days until extraction |
| Organophosphate pesticides | Glass, amber | Cool, 4°C | 7 days until extraction |
| Phthalate esters | Glass, amber | Cool, 4°C | 7 days until extraction |
| Nitroaromatics | Glass, amber | Cool, 4°C 0.008 percent $Na_2S_2O_3$ | 7 days until extraction |
| Chlorinated hydrocarbons | Glass, amber | Cool, 4°C | 7 days until extraction |

## 2.6 Sampling Procedures

Sample bottles will be cleaned according to the type of analysis required. Standard Operating Procedures describe the cleaning methods for each bottle code. Sample preservatives and holding times per parameter are shown in Table 2.6.1.

| Parameter | Bottle Code | Preservation[1] | Holding Time |
|---|---|---|---|
| Metals | Red | $HNO_3$ to pH <2 | 1 month |
| Na, K, Ca, Mg | White | -- | 7 days |
| Hexavalent chromium | White | -- | 2 days |
| Acidity | White | -- | 14 days |
| Alkalinity | White | -- | 14 days |
| Ammonia | Yellow | $H_2SO_4$ to pH <2 | 1 month |
| BOD | White | -- | 2 days |
| Chloride | White | -- | 14 days |
| COD | Yellow | $H_2SO_4$ to pH <2 | 1 month |
| Cyanides, total | Green | NaOH to pH >12 | 14 days |
| Fluoride | White | -- | 1 month |
| Hardness | White | -- | 1 month |
| Nitrate | Yellow | $H_2SO_4$ to pH <2 | 2 days |
| Oil and Grease | Yellow (glass) | $H_2SO_4$ to pH <2 | 1 month |
| pH | White | -- | 2 hours |
| Phenols, total | Blue (glass) | 1 g $CuSO_4$/L, $H_3PO_4$ to pH <4 | 1 month |
| Specific Conductance | White | -- | 1 week |
| Sulfate | White | -- | 14 days |
| TDS | White | -- | 14 days |
| TOC | Yellow | $H_2SO_4$ to pH <2 | 1 month |
| TOX | White (glass) | -- | 14 days |

[1] All samples held at 4°C. Soil samples do not have any chemical preservatives.

Table 2.6.1 Preservation and Holding times for Samples

## 2.7 Sample Custody

Each sample or group of samples shipped to Acurex for analysis will be given an Acurex identification number. The Sample Custodian will record the client name, number of samples, and date in the Sample Control Log Book. The identification number will appear on a traveler that will be released when the samples are logged in. This traveler will identify the type of analyses requested for the samples. When all analyses are completed, all sample extracts will be gathered and stored. Two months after the report is sent, samples are disposed. Digests are safely disposed three months after the report goes out.

All data, reports, and documents pertaining to samples are stored by the Sample Custodian either at Acurex or off-site.

Samples requiring a higher degree of chain-of-custody are stored under strict lock-and-key procedures. Samples are signed out and back into the Sample Custodian's custody.

More detailed descriptions of sample custody are found in Standard Operating Procedures: OP-SCC 3 Sample Custodian Duties, OP-DIV 1 Chain of Custody, OP-DIV 5 Sample Tracking on IFBs, OP-DIV 3 Security of Laboratory, OP-QA 4 Assembly of Document Files, and OP-SCC 1 Receipt and Opening of Samples.

## 2.8 Calibration Procedures and Frequency

Calibration of the atomic absorption spectrometer will be performed at the beginning of each elemental analysis. After the instrument parameters are set, a multi-level (3-5) calibration will be performed. The instrument sensitivity will be determined. If the sensitivity is not comparable to the manufacturer's specifications, the instrument will be reset until it does meet specifications. A NBS certified standard of trace metals in water will be run if the determination of the samples are in the ppb range. If the determination is outside of the acceptance criteria of the NBS standard, the analysis will be stopped and corrected. After every five to ten samples, a check standard will be run to verify that the calibration is within 10%. A value outside of this range will cause the instrument to be recalibrated and the last five samples to be rerun. At the end of the run, five determinations are made of the "0" standard after the last check standard to determine the instrument detection limit which is defined as five times the standard deviation of the noise ("0" standard).

Table 2.8.1 lists the applicable Standard Operating Procedures per measurement parameter.

AA standards are replaced every six months. The new standard is checked against the old standard before replacement. If there is a large deviation, a certified standard is also run. If the new standard still does not match, it is remade.

| Parameter | Standard Operating Procedure | |
|---|---|---|
| Metals by AAS | OP-INORG 12 | AAS Setup For Flame Determinations |
| | OP-INORG 14 | Atomic Absorption Analysis |
| Hexavalent chromium | OP-INORG 16 | Hexavalent Chromium Analysis |
| Mercury | OP-INORG 7 | Level 1 Mercury Analysis |
| | OP-INORG 15 | Mercury Analysis of Soil and Water |
| Organic Lead | OP-INORG 17 | Organic Lead Analysis |
| Alkalinity | OP-INORG 26 | Total Alkalinity |
| Ammonia | OP-INORG 28 | Ammonia Determination |
| Chloride | OP-INORG 23 | Chloride Determination |
| Fluoride | OP-INORG 21 | Soluble Fluoride Analysis |
| pH | OP-INORG 19 | pH Determination |
| Specific conductance | OP-INORG 20 | Specific Conductance |
| Sulfate | OP-INORG 25 | Sulfate Analysis |

Table 2.8.1 Standard Operating Procedures - Calibration

## 2.9 Analytical Procedures

Only Acurex Standard Operating Procedures or methods found in EPA manuals, Standard Methods for the Examination of Water and Wastewater, or other standard accepted methods will be employed.

| Parameter | Acurex Standard Operating Procedure | |
|---|---|---|
| Metals | OP-INORG 7 | Level 1 Mercury Analysis |
| | OP-INORG 8 | Metals Digestion |
| | OP-INORG 12 | AAS Setup for Flame Determinations |
| | OP-INORG 13 | AAS Setup for Heated Graphite Furnace |
| | OP-INORG 14 | Atomic Absorption Analyses |
| | OP-INORG 15 | Mercury Analysis of Soil and Water |
| | OP-INORG 16 | Hexavalent chromium Analysis |
| | OP-INORG 17 | Organic Lead Analysis |
| | OP-INORG 18 | EP Toxicity Extraction |
| | OP-INORG 19 | California Assessment Manual Waste Extraction Test |
| Alkalinity | OP-INORG 26 | Total Alkalinity |
| Ammonia | OP-INORG 28 | Ammonia Determination |
| Chloride | OP-INORG 23 | Chloride Determination |
| Fluoride | OP-INORG 21 | Soluble Fluoride Analysis |
| Oil and Grease | OP-INORG 27 | Oil and Grease |
| pH | OP-INORG 19 | pH |
| Specific Conductance | OP-INORG 20 | Specific Conductance |
| Sulfate | OP-INORG 25 | Sulfate |

| Parameter | Acurex Standard Operating Procedure | |
|---|---|---|
| TDS | OP-INORG 9 | Total Dissolved Solids |
| TS | OP-INORG 11 | Total Solids |
| TSS | OP-INORG 10 | Total Suspended Solids |
| Turbidity | OP-INORG 24 | Nephelometric Determinations of the Turbidity of Aqueous Solutions |

## 2.10 Data Reduction, Validation and Reporting

The following describes data handling for general chemical analysis.

### 2.10.1 Equations

Equations to calculate measured parameters are found in the standard operating procedures used during the determination of the specified analyte. All measurements will be blank-corrected. Only in cases where the standard is worked up with the samples (such as mercury, phenol, or cyanide) will there be any correction for recovery. Normally spikes will be performed, but only when recovery is very low (less than 50%) will they be used to correct reported values and then only upon approval of the supervisor. Reporting units are in parts per million - either mg/L for aqueous samples or mg/kg for solid or sludge samples. In most cases, no more than two significant figures are reported with one significant figure used for the blank.

All raw data and calculations that are not written on printed data forms will be correctly entered into a laboratory logbook in a legible and orderly fashion. Example calculations and observations shall be included according to Standard Operating Procedure OP-QA6 (Laboratory Notebook Procedure).

### 2.10.2 Data Integrity

Blanks, duplicates, and spiked sample analyses will be used to validate data. Blanks will be run for all analyses. If the blank level is too high (causing the detection limit to be in the quantitative are of interest), the analysis will be repeated. Replicate analyses that are greatly outside of the QA objectives will cause the analysis to be repeated. Spiked sample analyses with recoveries that are greatly outside of the QA objectives will cause the analysis to be repeated.

Other important checks on the data include the linearity of the standard curve, the reproducibility of check standards, and the system sensitivity. Data transcription and calculations are also checked.

[illegible] <u>Data Flow</u>

Data is generated by the analyst who performs the analysis and does the data calculations. The supervisor reviews the reduced data and forwards it to the report writer who is normally the principal analyst. The report is approved by the Inorganics Manager before submission to the customer. The methods employed in the analyses shall be reported to the customer. A copy of the report and raw data are kept according to Standard Operating Procedure [illegible], Chain of Custody.

8.11 Internal QC Checks

Method blanks will be run at a minimum frequency of 1 per batch. Duplicate analyses will be performed at a minimum frequency of 1 per batch of 10 samples (10%). Matrix spike analyses will be performed at a minimum frequency of 1 per batch of 20 samples (5%).

Check standards are run every 5 to 10 samples on the atomic absorption spectrophotometer to verify that the calibration is within 10%. NBS water and other NBS samples may also be run to check analytical standards.

2.12 Performance and Systems Audits

The Department of Health Services performs a systems audit of general chemistry every three years. In additon, the Environmental Protection Agency also performs systems audits. Both groups submit samples for performance audits.

Internally, systems and performance audits are performed at least once every six months by the Inorganic Chemistry Manager. The Laboratory Director, Quality Assurance Representative, and Project Managers may also submit blind performance audit samples and conduct systems audits.

## 2.13 Preventive Maintenance

The instruments used in general chemistry are maintained by the manufacturers. The atomic absorption spectrophotometer receives a yearly preventive maintenance from Perkin-Elmer Corporation. The analytical balance receives a preventive maintenance every 6 months. The infrared spectrometer, ultraviolet/visable spectrometer, TOC analyses, and TOX analyses receive preventive maintenance as needed. Logbooks are kept for each instrument snowing instrument problems and service. Supplies of instrument expendables are maintained on a three month basis.

2.14.3 Completeness

Completeness will be calculated as the ratio of acceptable measurements obtained to the total number of planned measurements.

## 2.15 Corrective Action

Corrective actions are initiated whenever measurement precision, accuracy, or completeness deviate from the objectives established in section 2.5. In addition, corrective actions are initiated whenever problems are identified through the internal auditing procedures described in section 2.12.

Corrective actions begin with identifying the source of the problem. Potential problem sources include failure to adhere to prescribed measurement procedures, equipment malfunction, or systematic contamination. Corrective actions appropriate for these problems (respectively) are more intensive staff training, equipment repair followed by a more intensive preventive maintenance program, and removal of the source of contamination.

The supervisor has the primary responsibility for initiating and completing corrective actions for measurement systems. The QA representative monitors the progress of corrective actions and ensures they proceed in a timely manner. The inorganic chemistry manager approves all corrective actions, and depending on the severity of the problem, obtains concurrence from the client.

Section 2.16 QA Reports to Management

The inorganic chemistry manager is responsible for evaluating measurement accuracy, precision, and completeness on a routine basis, and reporting results from the evaluations to the laboratory director and the QA representative. Reports on corrective actions and their resolution are prepared by the responsible individual and submitted to the QA representative and the laboratory director. Results of performance audits are also submitted to the laboratory director and QA representative. Each analytical report will include a separate QA section which summarizes the data quality information.

## 2.7 Sample Custody

Each sample or group of samples shipped to Acurex for analysis will be given an Acurex identification number. The Sample Custodian will record the client name, number of samples, and date in the Sample Control Log Book. The identification number will appear on a traveler that will be released when the samples are logged in. This traveler will identify the type of analyses requested for the samples. When all analyses are completed, all sample extracts will be gathered and stored. Two months after the report is sent, samples are disposed of unless otherwise agreed with the client.

All data, reports, and documents pertaining to samples are stored by the Sample Custodian either at Acurex or offsite.

Samples requiring a higher degree of chain-of-custody are stored under strict lock-and-key procedures. Samples are signed out and back into the Sample Custodian's custody.

More detailed descriptions of sample custody are found in Standard Operating Procedures: OP-SCC 3 Sample Custodian Duties, OP-DIV 1 Chain of Custody, OP-DIV 5 Sample Tracking on IFBs, OP-DIV 3 Security of Laboratory, OP-QA 4 Assembly of Document Files, and OP-SCC 1 Receipt and Opening of Samples.

Separate log-in forms will be maintained for each instrument used in this project. For example, a separate log-in form will be used for the GC/MS and GC/EC instruments. This form identifies the sample number, the volume injected, the amount of internal standard added, the disk on which the data were stored temporarily, and the magnetic tape on which the data were stored permanently.

## 2.8 Calibration Procedures and Frequency

Calibration of the GC/MS system will be performed daily at the beginning of the day or with each 10 to 12 hours of instrument operating time. This will consist of mass calibration with FC-43, ion abundance calibration with DFTPP or BFB, and verification of response factors for each of the test compounds using standards of known concentrations. Decafluorotriphenyl phosphine (DFTPP) will be used to verify the ion abundance calibration for the GC/MS analysis of semivolatile organics, while the bromofluorobenzene (BFB) will be used to verify the ion abundance calibration for the GC/MS analysis of volatile organics. Response factors will be determined daily and will be compared with the average values from a five-level calibration performed at the beginning of the project or following major instrument repair. Other details of the required quality control measures are those described in the EPA Methods 624 and 625 (Federal Register 340 CFR, Part 136, October 26, 1984.)

Quantification of samples that are analyzed by GC/MS will be performed by internal standard calibration. Five to six internal standards will be used.

Quantitation of samples that are anlayzed by GC with element selective detectors will be performed by external standard calibration. Standards containing the compounds of interest will be analyzed at various concentrations (minimum three levels) to establish the linear range of the detector. Following the multilevel calibration, analysis of samples will be initiated. Single point calibration will be performed at the beginning of each day and at every tenth injection. The response factors from the single point calibration will be checked against the average response factors from

multilevel calibration. If a deviation greater than 20 percent occurs then system recalibration will be performed. Alternatively, fresh calibration standards will be prepared and analyzed to verify instrument calibration.

## 2.9 Analytical Procedures

The analytical procedures have been identified in Table 2.3-1 and are presented in detail in the references cited in the footnotes to Table 2.3-1.

## 2.10 Data Reduction, Validation, and Reporting

The following calculations will be used.

### 2.10.1 Determination of Concentration of Compound X By External Standard Quantitation Techniques (GC/MS Analysis)

Amount of a certain compound found in the water or soil will be calculated as follows:

$$\text{Amount found } (\mu g) = \frac{A_{compound}}{A_{I.S.}} \times \frac{W_{I.S.}}{RRF} \times \frac{V_{extract}}{V_{injected}}$$

where

$A_{compound}$ -- area of the quantitation ion for Compound X

$A_{I.S.}$ -- area of the quantitation ion for the internal standard

$W_{I.S.}$ -- amount of internal standard (ng)

RRF -- average relative response factor determined from multilevel calibration

$V_{extract}$ -- volume of extract (mL)

$V_{injected}$ -- volume injected ($\mu$L)

The concentration of Compound X in water or soil will be calculated as follows:

$$C_{water}(\mu g/L) = \frac{\text{Amount found } (\mu g)}{V_{water}(L)}$$

where

$V_{water}$ is the volume of water (L) used for extraction:

$$C_{soil}\ (\mu g/g) = \frac{\text{Amount found } (\mu g)}{W_{soil}(\text{dry weight})}$$

where:

$W_{soil}$ is the dry weight of soil (g) used for extraction

2.10.2 Determination of Concentration of Compound X by External Standard Quantification Techniques (GC Analysis)

The amount of test compound analyzed by GC will be calculated as follows:

$$\text{Amount found (ng)} = \frac{A_{compound}}{RF} \times \frac{V_{extract}}{V_{injected}}$$

where

$A_{compound}$ -- the absolute area of Compound X

$RF$ -- response factor determined from external standard calibration (absolute area counts/amount injected)

$V_{extract}$ -- volume of extract (mL)

$V_{injected}$ -- volume injected (µl)

Concentration of compound in water or soil will be calculated as indicated above in 2.10.1 using the appropriate units.

2.10.3 Document Control System

A document control system ensures that all documents are accounted for when the project is complete.

A project number is issued upon approval of the work plan. This number must appear on sample identification tags, logbooks, data sheets, control charts, project memos and reports, document control logs, corrective action forms and logs, QA plans, and other project records.

2.10.4 QC Checkpoints and Data Flow

The following specific QC checkpoints will be common to all GC/MS and GC analyses. They are presented with the decision points:

Chemist -- Bench Level Checks

- Systems check: sensitivity, linearity, and reproducibility within specified limits
- Duplicate analyses within specified limits
- Surrogate spike results within specified limits
- Calculation/data reduction checks: calculations cross-checked; any discrepancies between forms and results evident; results tabulated sequentially on the correct forms

Supervisor

- Systems operating within limits
- Data transcription correct
- Data complete
- Data acceptable

Sample Control

- Results received for all samples within each experiment
- Samples returned to sample control

QA Manager

- QA objectives met

Project Manager

- Client requirements met

## 2.11 Internal Quality Control Checks

The following internal quality control checks will be implemented.

- Surrogate compounds will be added to all samples that are to be analyzed by EPA Methods 624, 625, 8240, 8270 including method blanks, duplicate samples, and matrix spikes. The compounds that will be used as surrogates and the levels recommended for spiking are given in (Table 2.11-1). Surrogate spike recoveries must fall within the limits listed in Table 2.11-2, otherwise analysis has to be repeated.
- To monitor the performance of the GC/MS system, internal standards such as: 1,4-dichlorobenzene-$d_4$, naphthalene-$d_8$, acenaphthene-$d_8$, phenanthrene-$d_{10}$, chrysene-$d_{12}$, perylene-$d_{12}$ (for semivolatile analysis) and bromochloromethane, 1,4-difluorobenzene, and chlorobenzene-$d_5$ (for volatile analysis) will be spiked, into each sample extract or sample to be purged, immediately prior to the GC/MS analysis.
- Method blanks will be run at a minimum frequency of one for every ten samples per matrix or with each batch if less than ten samples per batch
- One sample will be analyzed in duplicate for every ten samples or batch of samples, or type of matrix, whichever is more frequent
- In order to evaluate the matrix effect of the sample upon the analytical method, one sample per batch will be fortified with selected test compounds and analyzed. The compounds recommended for spike are given in Table 2.11-3. The matrix spike recoveries will be compared against those listed in Table 2.11-4 and the data will be used to evaluate the performance of the method.

Table 2.11-1. Spiking Concentrations Recommended for EPA Methods 624, 625, 8240, and 8270

| Compound | Amount in Sample Extract (µg) | | | | |
| --- | --- | --- | --- | --- | --- |
| | Fraction | Low $H_2O$ | Medium $H_2O$ | Low Soil | Medium Soil |
| Toluene-$d_8$ | VOA | 50 | 50 | 50 | 50 |
| 4-Bromofluorobenzene | VOA | 50 | 50 | 50 | 50 |
| 1,2-Dichloroethane-$d_4$ | VOA | 50 | 50 | 50 | 50 |
| Nitrobenzene-$d_5$ | BNA | 50 | 50 | 50 | 50 |
| 2-Fluorobiphenyl | BNA | 50 | 50 | 50 | 50 |
| p-Terphenyl-$d_{14}$ | BNA | 50 | 50 | 50 | 50 |
| Phenol-$d_5$ | BNA | 100 | 100 | 100 | 100 |
| 2-Fluorophenol | BNA | 100 | 100 | 100 | 100 |
| 2,4,6-Tribromophenol | BNA | 100 | 100 | 100 | 100 |

Table 2.11-2. Acceptable Recoveries of the Surrogate Compounds

| Fraction | Surrogate | Water | Soil |
| --- | --- | --- | --- |
| VOA | Toluene-$d_8$ | 86-119 | 69-127 |
| VOA | 4-Bromofluorobenzene | 85-121 | 61-122 |
| VOA | 1,2-Dichloroethane-$d_4$ | 77-120 | 64-129 |
| BNA | Nitrobenzene-$d_5$ | 41-120 | 24-115 |
| BNA | 2-Fluorobiphenyl | 44-119 | 37-120 |
| BNA | p-Terphenyl-$d_{14}$ | 33-128 | 28-133 |
| BNA | Phenol-$d_5$ | 15-96 | 20-106 |
| BNA | 2-Fluorophenol | 23-107 | 24-111 |
| BNA | 2,4,6-Tribromophenol | 20-105 | 11-102 |

Table 2.11-3. Matrix Spiking Compounds

| Base/Neutrals | Acids. | Volatiles |
|---|---|---|
| 1,2,4-Trichlorobenzene | Pentachlorophenol | Chlorobenzene |
| Acenaphthene | Phenol | 1,1,-Dichloroethane |
| 2,4-Dinitrotoluene | 2-Chlorophenol | Toluene |
| Di-n-butyl phthalate | 4-Chloro-3-methylphenol | Trichloroethene |
| Pyrene | 4-Nitrophenol | Benzene |
| N-Nitroso-di-n-propylamine | | |
| 1,4-Dichlorobenzene | | |

Table 2.11-4. Matrix Spike Recovery Limits[a]

| Fraction | Matrix Spike Compound | Water[a] | Soil/Sediment[a] |
|---|---|---|---|
| VOA | 1,1-Dichloroethene | 61-145 | 59-172 |
| VOA | Trichlorethene | 71-120 | 62-137 |
| VOA | Chlorobenzene | 75-130 | 60-133 |
| VOA | Toluene | 75-125 | 59-139 |
| VOA | Benzene | 76-127 | 66-142 |
| BN | 1,2,4-Trichlorobenzene | 39-98 | 38-107 |
| BN | Acenaphthene | 46-118 | 31-137 |
| BN | 2,4-Dinitrotoluene | 24-96 | 28-89 |
| BN | Di-n-butyl phthalate | 11-117 | 29-135 |
| BN | Pyrene | 26-127 | 35-142 |
| BN | N-Nitroso-di-n-propylamine | 41-116 | 41-126 |
| BN | 1,4-Dichlorobenzene | 36-97 | 28-104 |
| Acid | Pentachlorophenol | 9-103 | 17-109 |
| Acid | Phenol | 12-89 | 26-90 |
| Acid | 2-Chlorophenol | 27-123 | 25-102 |
| Acid | 4-Chloro-3-methylphenol | 23-97 | 26-103 |
| Acid | 4-Nitrophenol | 10-80 | 11-114 |
| Pest. | Lindane | 56-123 | 46-127 |
| Pest. | Heptachlor | 40-131 | 35-130 |
| Pest. | Aldrin | 40-120 | 34-132 |
| Pest. | Dieldrin | 52-126 | 31-134 |
| Pest. | Endrin | 56-121 | 42-139 |
| Pest. | 4,4'-DDT | 38-127 | 23-134 |

[a]These limits are for advisory purposes only. They are not to be used to determine if a sample should be reanalyzed. When sufficient multi-lab data are available, standard limits will be calculated.

- Analyze quality control samples monthly. These samples will be obtained from the EPA Cincinnati and will be released by the Sample Control monthly at the beginning of each month. A minimum of one quality control sample for each type of analysis (e.g., purgeable GC/MS, halogenated purgeables, purgeables aromatics) will be performed monthly.

## 2.12 Performance and System Audits

System audits are required to monitor the capability and performance of the measurement system. They will be conducted monthly and will include audits of procedures to determine their proper selection and use. Furthermore, laboratory notebooks and sample labeling for a specific project will be audited by the QA representative.

The performance audit will consist of the analysis of a quality control sample. The results will be reviewed by the Project Manager. If deficiencies are found then the corrective action will be discussed with the Laboratory Director and implemented immediately.

## 2.13 Preventive Maintenance

Acurex currently operates a three-GC/MS unit operation and is located within 7 miles of the suppliers local Finnigan office. The preventive maintenance of the GC/MS instruments is performed on an as needed basis in addition to a thorough instrument maintenance twice a year. Extra parts such as ion sources, filament assemblies, mass analyzers, electron multipliers are in stock at Acurex. The GC/MS Operations Manager is responsible for the preventive maintenance of the GC/MS instruments.

The preventive maintenance of the GC instruments is also done on an as needed basis by Richard Wood and Nicki Heath, who were formerly with Varian and Associates.

## 2.14 Specific Routine Procedures Used to Assess Data Precision, Accuracy, and Completeness

Precision will be determined through duplicate analyses. Accuracy will be determined on spiked sample analyses and performance audit analyses. Whenever accuracy, precision or completeness deviates from the goal itemized in Section 2.5, the source of the problem will be determined and corrected.

### 2.14.1 Precision

Precision as percent relative difference will be calculated as follows:

$$\text{Precision} = \frac{X_1 - X_2}{\frac{X_1 + X_2}{2}} \times 100$$

where $X_1$ is the larger value and $X_2$ is the smaller value of 2 replicate values.

### 2.14.2 Accuracy

Accuracy as percent recovery will be calculated from results of analyses of spiked samples as follows:

$$\text{Accuracy} = \frac{A - B}{C} \times 100$$

where

A = the analyte determined experimentally from the spiked sample

B = the background level determined by a separate analysis of the unspiked sample

C = the amount of the spike added

Accuracy as percent recovery will also be measured on determinations of performance audit samples.

2.14.3 Completeness

Completeness will be calculated as the ratio of acceptable measurements obtained to the total number of planned measurements.

2.15 Corrective Action

Corrective actions are initiated whenever measurement precision, accuracy, or completeness deviate from the objectives established in Section 2.5. In addition, corrective actions are initiated whenever problems are identified through the internal auditing procedures described in Section 2.12.

Corrective actions begin with identifying the source of the problem. Potential problem sources include failure to adhere to prescribed measurement procedures, equipment malfunction, or systematic contamination. Corrective actions appropriate for these problems (respectively) are more intensive staff training, equipment repair followed by a more intensive preventive maintenance program, and removal of the source of contamination.

The supervisor has the primary responsibility for initiating and completing corrective actions for measurement systems. The QA representative monitors the progress of corrective actions and ensures that they proceed in a timely manner. The GC/MS Operations Manager approves all corrective actions, and depending on the severity of the problem, obtains concurrence from the client.

## 2.16 QA Reports to Management

The GC/MS Operations Manager and the GC Task Leader are responsible for evaluating measurement accuracy, precision, and completeness on a routine basis, and reporting results from the evaluations to the Laboratory Director and the QA Representative. Reports on corrective actions and their resolution are prepared by the responsible individual and submitted to the QA Representative and the Laboratory Director. Results of performance audits are also submitted to the Laboratory Director and QA Representative. Each analytical report will include a separate QA section which summarizes the data quality information.

# QUALITY ASSURANCE PLAN

# FOR

# ACUREX WATER LABORATORY

# (GENERAL CHEMICAL)

For

Department of Health Services
State of California
Berkeley, California 94704

By

Acurex Corporation
Energy & Environmental Division
555 Clyde Avenue
P.O. Box 7044
Mountain View, California 94039

F-57

## 1. INTRODUCTION

The purpose of this Quality Assurance Plan is to describe the procedures that are used to assure the degree of quality of general chemical analyses. While this Quality Assurance Plan is in EPA format, it is applicable to Water Laboratory analyses as approved by the State of California Department of Health Services.

# QUALITY ASSURANCE PLAN

FOR

ACUREX WATER LABORATORY

(GENERAL CHEMICAL)

Approved by:

| | | |
|---|---|---|
| Inorganic Chemistry Manager: | Greg Nicoll<br>Greg Nicoll | Jan. 10, 1986<br>Date |
| Acting Laboratory Director: | James G. Thompson | Jan 10, 1986<br>Date |
| Acurex Quality Assurance Representative: | Sarah R. Schoen<br>Sarah R. Schoen, Ph.D. | Jan 10, 1986<br>Date |

CONTENTS



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Personnel Receiving Copies of Approved Quality Assurance Plan

| Project Responsibility | Name |
|---|---|
| Acting Laboratory Director | James G. Thompson |
| QA Representative | Sarah R. Schoen |
| Inorganic Chemistry Manager | Greg Nicoll |
| Sample Control Custodian | Efren Sablan |
| AA Analyses | Patrick M. Hirata |
| General Analyses | J. Romeo Milanes |

## 2.3 Project Description

The purpose of this project is to provide quantitative inorganic analyses on water, wastewater, sludge, soil, and sediment. Specifically, metals, ions, and other general chemical parameters will be measured for industry and government. In addition to atomic absorption spectrophotometry, selective ion electrode measurement, titration, and colorimetry will also be employed.

## 2.4 Project Organization and Responsibility

The Acting Laboratory Director is James G. Thompson. The QA representative for this project is Dr. Sarah Schoen, who will approve procedures and review quality assurance data. Greg Nicoll will manage the project. The sample custodian, who is responsible for tracking all samples, is Efren Sablan. Pat Hirata will be responsible for all atomic absorption analyses. J. Romeo Milanes will be responsible for all general chemical analyses excluding atomic absorption spectrophotometry.

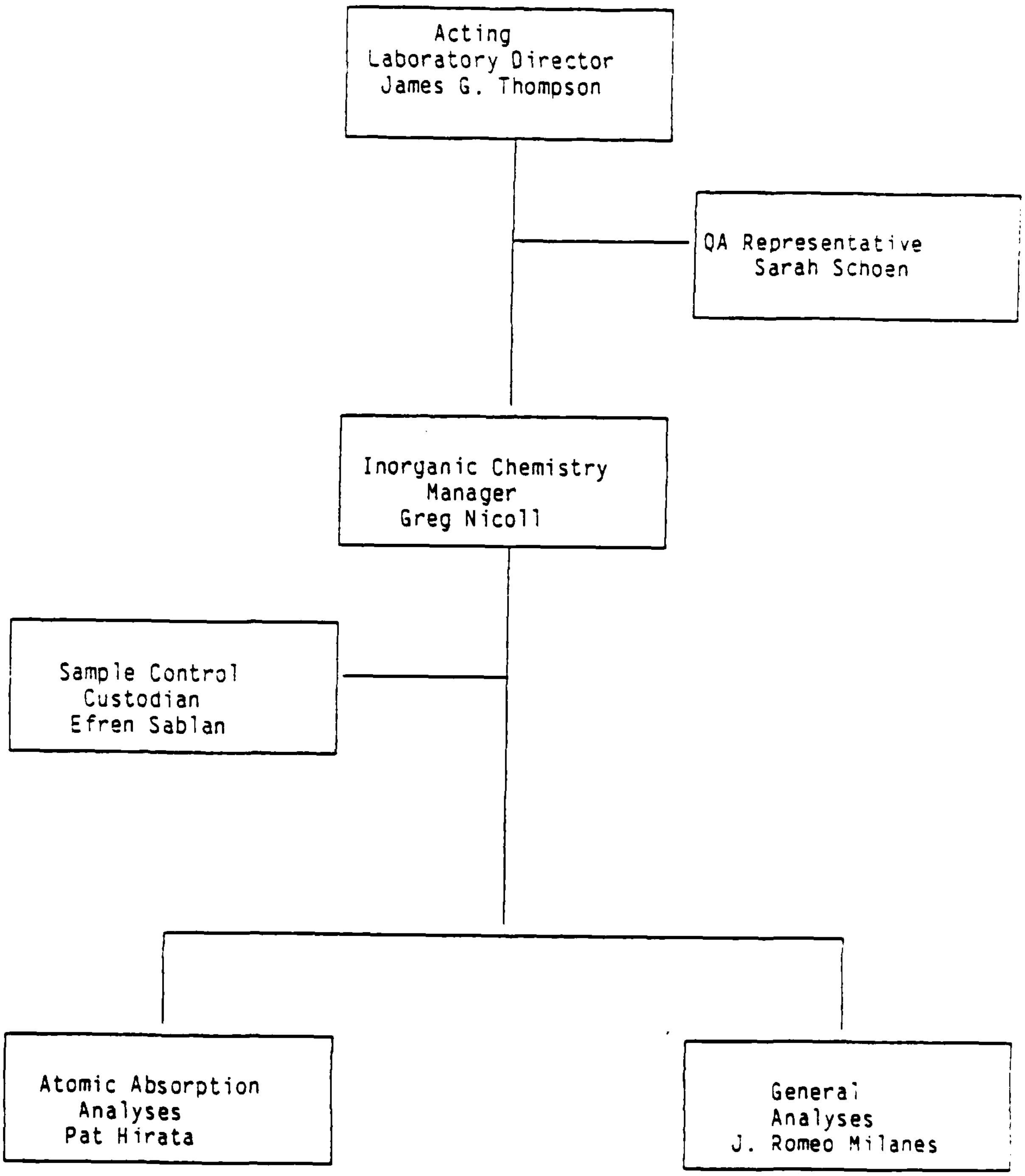


Figure 2.4-1. Project Organization

## APPENDIX G

Chain of Custody Forms

Acurex Corporation / AeroVironment Inc.

Sheet 1 of 3
in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

8510-048

RECEIVED
NOV 01 1985
AeroVironment INC.

Site BEALE AFB
AV Project No. 10416K

Date 10/22/85
Acurex Project No.

Test Location BEST SLOUGH #17
Sampler(s) MILLER/TAYLOR/KEATING

**SAMPLES:**

1. 904194 17-01-S1 ✓
2. 904195 17-01-S2 ✓
3. 904196 17-02-S1 ✓
4. 904191 17 02 S2 ✓
5. 904192 17 03 S1 ✓
6. 904193 17 03 S2 ✓
7.
8.
9.
10.
11.
12.

(6)

Field Supervisor Doug Taylor Date

Samples Collected 10/22/85 1:30 - 6:00 PM

Field Supervisor Date

Samples Released to Time

Laboratory Date

Samples Accepted Time

Laboratory Acurex Date 10/25/85

Samples Accepted Efren A. Jocklan

After Analysis Samples To Be: Disposed of

Saved for Storage

Project Engineer



AV-F-HW01

Acurex Corporation / AV AeroVironment Inc.

Sheet 2 of 3 in this shipment

## SAMPLE HANDLING LOG 8510-048

### Chain of Custody

Site BEALE AFB AV Project No. 10416 K

Date 10/23/85 Acurex Project No.

Test Location BEST SLOUGH #17 ENTOMOLOGY #9 Sampler(s) TAYLOR/KEATING

**SAMPLES:**

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 904215 | 17 | 04 | S1 ✓ | 7. | 904221 | 09 | 01 S1 ✓ |
| 2. | 904216 | 17 | 04 | S2 ✓ | 8. | 904224 | 09 | 01 S2 ✓ |
| 3. | 904217 | 17 | 05 | S1 ✓ | 9. | 904222 | 09 | 02 S1 ✓ |
| 4. | 904218 | 17 | 05 | S2 ✓ | 10. | 904223 | 09 | 02 S2 ✓ |
| 5. | 904219 | 17 | 06 | S1 ✓ | 11. | | | |
| 6. | 904220 | 17 | 06 | S2 ✓ | 12. | | | |

Field Supervisor Doug Taylor Date 10/23/85

Samples Collected 8:00 AM – 6:00 PM

Field Supervisor Date

Samples Released to Time

Laboratory Date

Samples Accepted Time

Laboratory Acurex Date 10/28/85

Samples Accepted Efren A. [illegible]

After Analysis Samples To Be: Disposed of

Saved for Storage

Project Engineer



AV-F-HW01

Acurex Corporation / AeroVironment Inc.

Sheet 3 of 3
in this shipment

# SAMPLE HANDLING LOG

**Chain of Custody**

8510-048

Site BEALE AFB

AV Project No. 10416K

Date 10/24/85

Acurex Project No.

Test Location AGE MAINTENANCE

Sampler(s) TAYLOR / KEATING

**SAMPLES:**

1. 904226 11 01 S1 ✓
2. 904225 11 01 S2 ✓
3. 904227 11 02 S1 ✓
4. 904230 11 02 S2 ✓
5. 904245 11 02 S3 ✓ — on hold per/Doug 10/29/85 - Taylor
6. 904229 09 02 S3 ✓
7. 904228 17 01 S3 ✓
8.
9.
10.
11.
12.

(7)

Field Supervisor Doug Taylor Date 10/24

Samples Collected 11:00 Am - 2:30 Pm

Field Supervisor Date

Samples Released to Time

Laboratory Date

Samples Accepted Time

Laboratory Acurex Date 10/25/85

Samples Accepted [signature]

After Analysis Samples To Be: Disposed of

Saved for Storage

Project Engineer



AV-F-HW01

ACUREX Corporation / AeroVironment Inc.

Sheet 1 of 1 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site BEALE AFB | AV Project No. 10416K

Date 10/25/85 | Acurex Project No.

Test Location AGE MAINT. #11 | Sampler(s) [illegible]/KEATING

**SAMPLES:**

1. 904248 11 03 S1
2. 904246 11 03 S2
3. 904247 11 03 S3 HOLD
4. 904249 11 04 S1
5. 904250 11 04 S2
6. 904233 11 04 S3 HOLD

7.

8.

9.

10.

11.

12.

Field Supervisor ____ Date ____
Samples Collected ____

Field Supervisor ____ Date ____
Samples Released to ____ Time ____

Laboratory Acurex Lab Date 10/29/85
Samples Accepted Ellen J. Jablan Time ____

Laboratory ____ Date ____
Samples Accepted ____

After Analysis Samples To Be: Disposed of ____
Saved for Storage ____

Project Engineer ____



AV-F-HW01

Acurex Corporation / AeroVironment Inc.



# SAMPLE HANDLING LOG

## Chain of Custody

Site ______________________ AV Project No. ______________________

Date ______________________ Acurex Project No. ______________________

Test Location ______________________ Sampler(s) ______________________

**SAMPLES:**

| | | | |
|---|---|---|---|
| 1. | 904231 03 01 S1 | 7. | 904201 03 02 S3 |
| 2. | 904232 03 01 S2 | 8. | 904202 03 03 S1 |
| 3. | 904197 03 01 S3 | 9. | 904203 03 03 S2 |
| 4. | 904198 03 01 S4 [redacted] HOLD | 10. | 904204 03 03 S3 |
| 5. | 904199 03 02 S1 | 11. | 904205 03 03 S4 HOLD |
| 6. | 904200 03 02 S2 | 12. | 904206 03 04 S1 904206 |

Field Supervisor ______________________ Date ______________________
Samples Collected ______________________

Field Supervisor Doug Taylor Date 11/1/85
Samples Released to GREYHOUND Time 7:00 PM

Laboratory ACUREX LAB Date 11/4/85
Samples Accepted Ellen Auchlan Time 11:30 A.M.

Laboratory ______________________ Date ______________________
Samples Accepted ______________________

After Analysis Samples To Be: Disposed of ______________________
Saved for Storage ______________________

Project Engineer ______________________



AV-F-HW01

Acurex Corporation / AeroVironment Inc.

Sheet 2 of 2 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site [illegible]

AV Project No. [illegible]

Date [illegible]

Acurex Project No. [illegible]

Test Location [illegible]

Sampler(s) [illegible]

**SAMPLES:**

1. 904207 03 04 S2
2. 904208 03 04 S3
3. 904209 03 05 S1 HOLD
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 
12. 

Field Supervisor [illegible] Date [illegible]

Samples Collected [illegible]

Field Supervisor Doug Taylor Date 11/1/85

Samples Released to GREYHOUND BUS Time 7:00 PM

Laboratory Acurex LAB Date 11/4/85

Samples Accepted [illegible] Time 11:30 AM

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

Project Engineer



AV-F-HW01

ACUREX Corporation / AeroVironment Inc.



# SAMPLE HANDLING LOG

## Chain of Custody

Site: BEALE AFB

AV Project No.: 10416K

Date: 11/1/85

Acurex Project No.:

Test Location: FPTA

Sampler(s): TAYLOR / LONDAHL

**SAMPLES:**

| | | | |
|---|---|---|---|
| 1. | 904210 03 05 S2 | 7. | 904235 03 07 S1 |
| 2. | 904211 03 05 S3 | 8. | 904237 03 07 S2 |
| 3. | 904213 03 06 S1 | 9. | 904238 03 07 S3 |
| 4. | 904214 03 06 S2 | 10. | 904239 03 07 S4 |
| 5. | 904236 03 06 S3 | 11. | 904240 03 08 S1 |
| 6. | 904224 03 06 S4 | 12. | 904241 03 08 S2 |

Field Supervisor: DOUG TAYLOR Date: 11/1/85

Samples Collected: 7:00 - 5:00

Field Supervisor: Doug Taylor Date: 11/1/85

Samples Released to: GREYHOUND BUS Time: 7:00 Pm

Laboratory: Acurex LAB Date: [illegible]

Samples Accepted: [illegible] Time: [illegible]

Laboratory: Date:

Samples Accepted:

After Analysis Samples To Be: Disposed of

Saved for Storage

Project Engineer



AV-F-H701

ACUREX Corporation / AeroVirc nent Inc.

Sheet 2
in this shi

# SAMPLE HANDLING LOG

## Chain of Custody

Site: BEALE AFB FPTA + ENT
AV Project No.: 10416 K

Date: 1/1/85
Acurex Project No.:

Test Location: FPTA + ENTOMOLOGY
Sampler(s): TAYLOR / LONDAHL

**SAMPLES:**

1. 904242 03 08 53
2. 904243 09 03 51
3. 904244 09 03 52
4. 904212 03 05 54
5. 904254 03 04 54
6. 904251 03 05 55
7. 904252 03 07 55
8.
9.
10.
11.
12.

Field Supervisor: DOUG TAYLOR
Date: 1/1

Samples Collected: 7:00 – 5:00

Field Supervisor: Doug Taylor
Date: 1/1/85

Samples Released to: GREYHOUND BUS
Time: 7:00 PM

Laboratory: Acurex Labs
Date: [illegible]

Samples Accepted: [illegible]
Time: [illegible]

Laboratory:
Date:

Samples Accepted:

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer:



AV-F-[illegible]

Corporation / AeroVironment Inc.

Sheet 1 of __ in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

8511-033

Site BEALE AFB AV Project No. 10416 K

Date 11/12/85 Acurex Project No.

Test Location INJ. WELL #2 - SITE 2 Sampler(s) SHERYL THURSTON, DOUG TAYLOR, CHRIS ...

SAMPLES:

1. 904253 02 01 S1 ✓
2. HOLD 904255 02 01 S2 ✓
3. 904256 02 01 S3 ✓
4. HOLD 904257 02 01 S4
5. 904258 02 02 S1 ✓
6. HOLD 904259 02 02 S2 ✓
7. 904260 02 02 S3 ✓
8. 904261 02 02 S4 ✓ HOLD
9. 904262 02 03 S1 ✓
10. 904263 02 03 S2 ✓ HOLD
11. 904264 02 03 S3
12. 904265 02 03 S4 ✓ HOLD

Field Supervisor [illegible] Date 11/12/85

Samples Collected 12 SAMPLES SOIL [illegible]

Field Supervisor [illegible] Date

Samples Released to [illegible] Time 7:45 PM

Laboratory Acurex LAB Date 11/14/85

Samples Accepted [signature] Time 1100

Laboratory ______ Date ______

Samples Accepted ______

After Analysis Samples To Be: Disposed of ______

Saved for Storage ______

Project Engineer ______



AV-F-HW01

Acurex Corporation / AeroVironment Inc.

Sheet 2 of 4
in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

**8511-033**

Site Beale AFB

AV Project No. 10416 K

Date 11/12/85

Acurex Project No.

Test Location INS WELL #2 - SITE 2

Sampler(s) SHERYL THURSTON
DOUG TAYLOR
CHRIS LOVDAHL

**SAMPLES:**

1. 904266 02 04 S1 ✓
2. 904267 02 04 S2 ✓
3. 904268 02 04 S3 ✓
4. 904269 02 04 S4 ✓
5.
6.
7.
8.
9.
10.
11.
12.

Field Supervisor [illegible] Date 11/14/85

Samples Collected 4 soil boring samples

Field Supervisor [redacted] Date

Samples Released to Time 7:45 pm

Laboratory Acurex Lab Date 11/14/85

Samples Accepted [illegible] Time 1100

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-H[illegible]

ACUREX Corporation / AeroVir[illegible]ment Inc.

Sheet 3 of ___
in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

8511-033

Site [illegible] AFB    AV Project No. [illegible]

Date 1[illegible]    Acurex Project No. ___

Test Location [illegible]    Sampler(s) [illegible]

**SAMPLES:**

| | |
|---|---|
| 1. 904270 12 01 S1 | 7. 904276 12 03 S1 |
| 2. 904271 12 01 S2 | 8. 904277 12 03 S2 |
| 3. 904272 12 01 S3 | 9. 904278 12 03 S3 |
| 4. 904273 12 02 S1 | 10. 904279 05 01 S1 |
| 5. 904274 12 02 S2 | 11. 904280 05 01 S2 |
| 6. 904275 12 02 S3 | 12. 904281 05 01 S3 |

Field Supervisor ___ Date ___
Samples Collected ___

Field Supervisor ___ Date ___
Samples Released to ___ Time 2:45 pm

Laboratory Acurex LAB Date 11/14/85
Samples Accepted [signature] Time 1100

Laboratory ___ Date ___
Samples Accepted ___

After Analysis Samples To Be: Disposed of ___
Saved for Storage ___

Project Engineer ___

ACUREX Corporation / AeroVirc nent Inc.

Sheet ✓ of /
in this shipment

# SAMPLE HANDLING LOG

**Chain of Custody**

8511-033

Site ______ AV Project No. ______

Date ______ Acurex Project No. ______

Test Location ______ Sampler(s) ______

**SAMPLES:**

| | |
|---|---|
| 1. 904282 05 01 S4 | 7. |
| 2. 904283 05 02 S1 | 8. |
| 3. 904284 05 02 S2 | 9. |
| 4. 904285 05 02 S3 | 10. |
| 5. 904286 05 02 S4 | 11. |
| 6. | 12. |

Field Supervisor ______ Date ______
Samples Collected ______

Field Supervisor ______ Date ______
Samples Released to ______ Time 7:45 am

Laboratory Acurex Lab Date 11/18/85
Samples Accepted Eileen A' [illegible] Time 1100

Laboratory ______ Date ______
Samples Accepted ______

After Analysis Samples To Be: Disposed of ______
Saved for Storage ______

Project Engineer ______

ACUREX Corporation / AeroVironment Inc.

Sheet 1 of 1
in this shipment

# SAMPLE HANDLING LOG

8511-035

**Chain of Custody**

Site BEALE AFB    AV Project No. 10146 K

Date 11/14/85    Acurex Project No. ______

Test Location SITES 2, 5, 12    Sampler(s) TAYLOR/THURSTON/LOVDAHL

**SAMPLES:**

1. 12-01-S4
2. 02-04-S5
3. 05-01-S5
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 
12. 

Collected 11/13/85

RECEIVED
NOV 18 1985
AeroVironment Inc.

Field Supervisor [signature]    Date 11/14/85
Samples Collected 3 Soil Borings

Field Supervisor [signature]    Date 11/14/85
Samples Released to Greyhound    Time 6 30 pm

Laboratory Acurex Lab    Date 11/15/85
Samples Accepted Efren A. Sablan    Time 0845

Laboratory ______    Date ______
Samples Accepted ______

After Analysis Samples To Be:    Disposed of ______
Saved for Storage ______

Project Engineer ______



AV-F...

Acurex Corporation / AeroVironment Inc.

Sheet 1 of 5 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

**8511-039**

Site BEALE AFB  AV Project No. 10416K

Date 11/16/85  Acurex Project No.

Test Location SITE 5 - SR 71 SHELTER  Sampler(s) THURSTON / O'GARA / COUDAHL

**SAMPLES:**

| | | | |
|---|---|---|---|
| 1. | 904287 05 03 51 ✓ | 7. | 810722 05 04 53 HOLD |
| 2. | 904288 05 03 52 ✓ | 8. | 810723 05 04 54 ✓ |
| 3. HOLD | 904289 05 03 53 | 9. | 810724 05 05 51 ✓ |
| 4. | 904290 05 03 54 | 10. | 810725 05 05 52 ✓ |
| 5. | 904291 05 04 51 ✓ | 11. | 810726 05 05 53 ✓ |
| 6. | 904292 05 04 52 ✓ | 12. | 810727 05 06 51 ✓ |

Field Supervisor [illegible]  Date 11/ [illegible]

Samples Collected

Field Supervisor Andrew Thurston  Date 11/18/85

Samples Released to Greyhound  Time 7:30 pm

Laboratory Acurex LAB  Date 11/19/85

Samples Accepted [signature]  Time 10:30 a.m.

Laboratory  Date

Samples Accepted

After Analysis Samples To Be:  Disposed of

Saved for Storage

Project Engineer

Acurex Corporation / AeroVironment Inc.



# SAMPLE HANDLING LOG

**Chain of Custody** 8511-039

Site BEALE AFB AV Project No. 0416K

Date 11/17/85 Acurex Project No.

Test Location Site 5 SR-71 Shelter/ Site 18 Bulk Fuel Storage Sampler(s) Thurston/ O'Garz/ Lovdahl

**SAMPLES:**

| | | | |
|---|---|---|---|
| 1. | 810728 05 06 S2 ✓ | 7. | HOLD 810734 18 01 S4 |
| 2. | 810729 05 06 S3 ✓ | 8. | 810735 18 01 S5 ✓ |
| 3. | HOLD 810730 05 06 S4 | 9. | HOLD 810736 18 01 S6 |
| 4. | ② 810731 18 01 S1 ✓ | 10. | HOLD 810737 18 01 S7 ② |
| 5. | HOLD 810732 18 01 S2 | 11. | HOLD 810738 18 [illegible] [illegible] |
| 6. | 810733 18 01 S3 ✓ | 12. | 810739 18 0 [illegible] |

Field Supervisor Sheryl Thurston Date [illegible]15/85
Samples Collected

Field Supervisor Sheryl Thurston Date 11/18/85
Samples Released to Greyhound Time 7:30 pm

Laboratory Acurex Labs Date 11/19/85
Samples Accepted [illegible signature] Time 10:30 AM

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-H[illegible]

ACUREX Corporation / AeroViror ent Inc.

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# SAMPLE HANDLING LOG 8511-039

## Chain of Custody

Site BEALE AFB AV Project No. 10416K

Date 11/15/85 Acurex Project No.

Test Location Site #18 Bulk Fuel-Storage Sampler(s) Thurston/O'Gara/Lovdahl

**SAMPLES:**

1. 810740 18 02 S1 ✓
2. HOLD 810741 18 02 S2
3. 810742 18 02 S3 ✓
4. HOLD 810743 18 02 S4
5. 811472 18 02 S5
6. HOLD 811473 18 02 S6
7. 811474 18 02 S7 HOLD
8. 811475 18 02 S8 HOLD
9. 811476 18 02 S9 ✓ 2
10. 811477 18 03 S1 ✓ 2
11. 811478 18 03 S2 HOLD 2
12. 811479 18 03 S3 ✓

Field Supervisor [illegible] Date [illegible]
Samples Collected

Field Supervisor Sheryl Thurston Date 11/18/85
Samples Released to Greyhound Time 7:30 pm

Laboratory Acurex Lab Date 11/19/85
Samples Accepted [illegible signature] Time 10:30 a.m.

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer

ACUREX Corporation / AeroVironment Inc.



# SAMPLE HANDLING LOG

## Chain of Custody

8511-039

Site BEALE AFB AV Project No. 1046IC

Date 11/16/85 Acurex Project No.

Test Location Site #3 - Bulk Fuel Storage Sampler(s) Thurston/O'Sara/Landin

**SAMPLES:**

| | | | |
|---|---|---|---|
| 1. | HOLD 811480 18 03 54 | 7. | 811486 18 04 51 ✓ |
| 2. | 811481 18 03 55 ✓ | 8. | 811487 18 04 52 HOLD ② |
| 3. | HOLD 811482 18 03 56 | 9. | 811488 18 04 53 ✓ |
| 4. | HOLD 811483 18 03 57 | 10. | 811489 18 04 54 HOLD ② |
| 5. | ② HOLD 811484 18 03 58 | 11. | 811490 18 04 55 ✓ |
| 6. | ② 811485 18 03 59 ✓ | 12. | 811491 18 04 56 HOLD |

Field Supervisor Sheryl Thurston Date 11/16/85
Samples Collected

Field Supervisor Sheryl Thurston Date 11/18/85
Samples Released to Greyhound Time 7:30pm

Laboratory Acurex LAB Date 11/19/85
Samples Accepted [signature] Time 10:30 A.M.

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-4/7/01

ACUREX Corporation / AeroViro ient Inc.



# SAMPLE HANDLING LOG

## Chain of Custody

8511-039

Site BEALE AFB AV Project No. 10416K

Date 11/16/85 Acurex Project No.

Test Location Site 13 - Bulk Fuel Storage Sampler(s) Thurston/O'Gara/Lardahl

SAMPLES:

| | | | |
|---|---|---|---|
| 1. 811492 18 04 S7 HOLD | 7. 810749 05 05 S4 ✓ |
| 2. 811493 18 04 S8 HOLD | 8. 810750 05 03 S5 ✓ |
| 3. 811494 18 04 S9 ✓ | 9. |
| 4. 810746 18 02 S10 ✓ | 10. |
| 5. 810747 18 04 S10 ✓ | 11. |
| 6. 810748 05 06 S5 ✓ | 12. |

Field Supervisor Sheryl Thurston Date 11/16/85
Samples Collected

Field Supervisor Sheryl Thurston Date ~~7:30p~~ 11/18/85
Samples Released to Greyhound Time 7:30 pm

Laboratory Acurex LAB Date 11/19/85
Samples Accepted [illegible] Time 10:30 AM

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-HW01

ACUREX Corporation / AeroVirc nent Inc.

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# SAMPLE HANDLING LOG

**8511-043**

## Chain of Custody

Site BEALE AFB | AV Project No. 10416 K

Date 11/19/85 | Acurex Project No.

Test Location SITE #13 LANDFILL 1 | Sampler(s) TAYLOR/WILBUR

**SAMPLES:**

1. 810753 13 01 W1 PHEN
2. 810758 13 02 W1
3. 810763 13 03 W1
4. 810768 13 04 W1
5. 810774 17 01 W1
6.
7.
8.
9.
10.
11.
12.

Field Supervisor [signature] Date 11/19/85

Samples Collected 5 SURFACE WATER SAMPLES FOR PHENOL 4201 - ANALYZE IMMEDIATELY

Field Supervisor [signature] Date 11/19/85

Samples Released to GREYHOUND Time 7:30 PM

Laboratory Acurex LAB Date 11/20/85

Samples Accepted [signature] Time 11:00 A.M

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-HW01

ACUREX Corporation / AeroVironment Inc.

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3 COOLERS IN SHIPMENT

# SAMPLE HANDLING LOG

## Chain of Custody

Site BEALE AFB

AV Project No. 10416K

Date 11/20/85

Acurex Project No.

Test Location BEALE AFB - SITE-7

Sampler(s) TAYLOR/WILBUR/THURSTON/COVDIHL

Composite 1,2,3,4 Composite 5,6,7,8 Composite 9,10...

**SAMPLES:**

| | | | |
|---|---|---|---|
| 1. | 810779 07 01 H1 | 7. | 810785 07 02 H1 |
| 2. | 810780 07 01 H1 | 8. | 810786 07 02 H1 |
| 3. | 810781 07 01 H1 | 9. | 810787 07 03 H1 |
| 4. | 810782 07 01 H1 | 10. | 810788 07 03 H1 |
| 5. | 810783 07 02 H1 | 11. | 810789 07 03 H1 |
| 6. | 810784 07 02 H1 | 12. | 810790 07 03 H1 |

Field Supervisor [signature] Date 11/20/85

Samples Collected 12 ... soil samples

Field Supervisor [signature] Date 11/20/85

Samples Released to GREYHOUND Time 7:30 PM

Acurex LAB Date 11/21/85

Accepted Efren A. Jabllan Time 10:00 A.M

Date

Disposed of

Saved for Storage



AV-F-HW01

ACUREX Corporation / AeroVironment Inc.

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# SAMPLE HANDLING LOG

## Chain of Custody

3 COOLERS IN SHIPMENT

Site BEALE AFB AV Project No. 10416K

Date 11/20/85 Acurex Project No. ____

Test Location BEALE AFB - SHES 3883 Sampler(s) TAYLOR/WILBUR/THURSTON/[illegible]

**SAMPLES:** COMPOSITE 1,2,3,4

COMPOSITE

| | |
|---|---|
| 1. 810791 07 04 H1 | 7. 810797 03 02 H1 |
| 2. 810792 07 04 H1 | 8. 810798 03 02 H2 |
| 3. 810793 07 04 H1 | 9. 810799 03 03 H1 |
| 4. 810794 07 04 H1 | 10. 810800 03 03 H2 |
| 5. 810795 03 01 H1 | 11. 810801 08 01 H1 |
| 6. 810796 03 01 H2 | 12. 810802 08 01 H2 |

Field Supervisor [signature] Date 11/20/85

Samples Collected 12 HAND [illegible] SOIL SAMPLES

Field Supervisor [signature] Date 11/20/85

Samples Released to GREYHOUND Time 7:30 pm

Laboratory ACUREX LAB Date 11/21/85

Samples Accepted [signature] Time 10:00 A.M

Laboratory ____ Date ____

Samples Accepted ____

After Analysis Samples To Be: Disposed of ____ Saved for Storage ____

Project Engineer ____



AV-F-HW01

ACUREX Corporation / AeroVironment Inc.

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3 COOLERS IN SHIPMENT

# SAMPLE HANDLING LOG

## Chain of Custody

Site BEALE AFB  AV Project No. 1341-K

Date 11/19/85  Acurex Project No. ____

Test Location ____  Sampler(s) ____

SAMPLES:

| | | | | | |
|---|---|---|---|---|---|
| 1. 810744 | 13 | 01 | W1 | 7. 810757 | 13 | 02 | W1 |
| 2. 810745 | 13 | 01 | W1 | 8. 810759 | 13 | 02 | W1 |
| 3. 810752 | 13 | 01 | W1 | 9. 810760 | 13 | 03 | W1 |
| 4. 810754 | 13 | 01 | W1 | 10. 810761 | 13 | 03 | W1 |
| 5. 810755 | 13 | 02 | W1 | 11. 810762 | 13 | 03 | W1 |
| 6. 810756 | 13 | 02 | W1 | 12. 810764 | 13 | 03 | W1 |

Field Supervisor ____ Date ____
Samples Collected 12 surface water samples from 3 sites

Field Supervisor ____ Date ____
Samples Released to ____ Time ____

Laboratory Acurex Lab  Date 11/21/85
Samples Accepted ____  Time 10:00 A.M

Laboratory ____ Date ____
Samples Accepted ____

After Analysis Samples To Be: Disposed of ____
Saved for Storage ____

Project Engineer ____



AV-F-4701

ACUREX Corporation / AeroVironment Inc.

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Sheet 4 of 6 in this shipment

# SAMPLE HANDLING LOG

**Chain of Custody**

Site [illegible] AV Project No. [illegible]

Date [illegible] Acurex Project No.

Test Location [illegible] Sampler(s) [illegible]

**SAMPLES:**

| | | | |
|---|---|---|---|
| 1. | 810765 13 04 W1 | 7. | 810775 17 01 W1 |
| 2. | 810766 13 04 W1 | 8. | 810778 13 01 B1 |
| 3. | 810767 13 04 W1 | 9. | 810777 13 02 B1 |
| 4. | 810769 13 04 W1 | 10. | 810770 13 03 B1 |
| 5. | 810771 17 01 W1 | 11. | 810776 13 04 B1 |
| 6. | 810773 17 01 W1 | 12. | |

Field Supervisor [illegible] Date [illegible]

Samples Collected [illegible]

Field Supervisor [illegible] Date [illegible]

Samples Released to [illegible] Time [illegible]

Laboratory Acurex Lab Date 11/21/85

Samples Accepted [illegible signature] Time 10:00 A.M.

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-H701

ACUREX Corporation / AeroVironment Inc.

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Sheet _ of _ in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site [illegible]

AV Project No. 10416 [illegible]

Date 11/21/85

Acurex Project No.

Test Location [illegible]

Sampler(s) [illegible]

**SAMPLES:**

1. 810803 08 02 H1
2. 810805 08 03 H1
3. 810806 08 03 H2
4. 810807 08 04 H1
5. 810808 13 04 [illegible]
6. 810809 13 04 [illegible]
7. 810810 13 04 [illegible]
8. 810811 13 04 [illegible]
9. 810830 13 04 [illegible]
10. 810831 13 05 [illegible]
11. 810832 13 05 [illegible]
12. 810833 13 05 [illegible]

Field Supervisor [illegible] Date [illegible]

Samples Collected [illegible]

Field Supervisor [illegible] Date [illegible]

Samples Released to [illegible] Time [illegible]

Laboratory Acurex Lab Date 11/21/85

Samples Accepted [signature] Time 10:00 A.M.

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

Project Engineer



AV-F-HW01

ACUREX Corporation / AeroVironment Inc.

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# SAMPLE HANDLING LOG

## Chain of Custody

Site ______ AFB

AV Project No. ______

Date ______

Acurex Project No. ______

Test Location ______

Sampler(s) ______

**SAMPLES:**

1. S10S34
2. S10S35
3. S10S36
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 
12. 

Field Supervisor ______ Date ______

Samples Collected ______

Field Supervisor ______ Date ______

Samples Released to ______ Time ______

Laboratory Acurex LAB Date 11/21/85

Samples Accepted ______ Time 10:00 P.M.

Laboratory ______ Date ______

Samples Accepted ______

After Analysis Samples To Be: Disposed of ______

Saved for Storage ______

Project Engineer ______



AV-F-HW01

ACUREX Corporation / AeroVironment Inc.

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in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site BEALE AFB | AV Project No. [illegible]
Date [illegible] | Acurex Project No.
Test Location [illegible] | Sampler(s) [illegible]

**SAMPLES:**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1. 811493 | [illegible] | [illegible] | H1 | 7. 810841 | [illegible] | 04 | [illegible] |
| 2. 810833 | [illegible] | 01 | H2 | 8. 810813 | 17 | 01 | H1 |
| 3. 810837 | [illegible] | 02 | H1 | 9. 810814 | 17 | 02 | H1 |
| 4. 810839 | [illegible] | [illegible] | H2 | 10. 810815 | 17 | 03 | H1 |
| 5. 810840 | [illegible] | [illegible] | [illegible] | 11. 810816 | 17 | 04 | H1 |
| 6. 810812 | [illegible] | [illegible] | [illegible] | 12. 810817 | 17 | 05 | H1 |

Field Supervisor [signature] Date 11/2?/85
Samples Collected 12 [illegible]

Field Supervisor [signature] Date 11/24/85
Samples Released to [illegible] Time 5 00 PM

Laboratory [illegible] Date [illegible]
Samples Accepted [signature] Time 1000

Laboratory ______ Date ______
Samples Accepted ______

After Analysis Samples To Be: Disposed of ______
Saved for Storage ______

Project Engineer ______



AV-F-HW01

ACUREX Corporation / AeroVirc nent Inc.

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# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB    AV Project No. 10416K

Date 11/22/85    Acurex Project No.

Test Location Site 14 Transformer Area    Sampler(s) Taylor/Wilson

**SAMPLES:**

1. 810821 14 01 A1
2. 810822 14 02 A1
3. 810819 14 03 A1
4. 810820 14 04 A1
5. 810823 14 05 A1
6. 810848 14 06 A1
7. 810851 14 07 A1
8. 810857 14 08 A1
9. 810854 14 09 A1
10. 810858 14 10 A1
11. 810855 14 11 A1
12. 810856 14 12 A1

Field Supervisor [signature]    Date 11/22/85
Samples Collected 12 soil samples hand auger

Field Supervisor [signature]    Date 11/24/85
Samples Released to Greyhound    Time 5 pm

Laboratory Acurex Lab    Date 11/25/85
Samples Accepted [signature]    Time 1000

Laboratory    Date
Samples Accepted

After Analysis Samples To Be:    Disposed of
Saved for Storage

Project Engineer



AV-F-HW01

ACUREX Corporation / AeroVir- -ment Inc.

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# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB    AV Project No. [illegible]

Date 11/21 & 11/22/85    Acurex Project No.

Test Location [illegible]    Sampler(s) Taylor/[illegible]

**SAMPLES:**

1. 810818 17 06 H1
2. 810859 11 01 H1
3. 810852 11 02 H1
4. 810853 11 02 H2
5. 810821 11 03 H1
6. 810825 11 03 H2
7. 810849 11 04 H1
8. 810850 11 04 H2
9. 810861 16 01 A1
10. 810862 16 01 A1
11. 810860 16 01 A1
12. Composite all 16-01-A1 samples (3) into one

Field Supervisor [signature]    Date 11/22/85

Samples Collected 11 soil samples . 3 to be composited

Field Supervisor [signature]    Date 11/24/85

Samples Released to Greyhound    Time [illegible]

Laboratory Acurex Lab    Date [illegible]

Samples Accepted [signature]    Time 1000

Laboratory ____    Date ____

Samples Accepted ____

After Analysis Samples To Be:    Disposed of ____
Saved for Storage ____

Project Engineer ____



AV-F-HW01

ACUREX Corporation / AeroVir   ment Inc.

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# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB
AV Project No. 10416 K
Date 11/22/85
Acurex Project No.
Test Location Site 3 (FPTA) E
Sampler(s) ~~TAYLOR~~/Wilbur/Livingston

**SAMPLES:**

1. 810823 03 01 B1
2. 810827 03 02 B1
3. 810863 01 01 W1
   PHENOL
4. 810864 01 01 W1
   O&G
5. 810823 01 01 W1
   METALS
6. 810874 01 01 B1
7. 810873 01 02 W1
8. 810872 01 02 W1
9. 810829 01 02 W1
10. 810875 01 02 B1
11. 810876 01 02 B2
12. 810879 0 03 W

Field Supervisor [signature] Date 11/25/85
Samples Collected 7 WATER SAMPLES, 5 BOTTOM SEDIMENT SAMPLES

Field Supervisor [signature] Date 11/24/85
Samples Released to GREYHOUND Time 5 pm

Laboratory HUNTER LAB Date 11/25/85
Samples Accepted [signature] Time 1000

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-HV01

ACUREX Corporation / AeroVironment Inc.

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# SAMPLE HANDLING LOG

## Chain of Custody

Site [illegible] AFO — AV Project No. 10416K

Date 11/23/85 — Acurex Project No.

Test Location — Sampler(s) TAYLOR/WILBUR/[illegible]

**SAMPLES:**

| | |
|---|---|
| 1. S10878 [illegible] | 7. 810881 01 03 B3 |
| 2. 810877 01 [illegible] [illegible] | 8. 810882 03 02 B3 |
| 3. S10870 [illegible] 03 W2 | 9. 810883 11 01 H2 |
| 4. 810869 01 03 W2 | 10. S10866 14 10 H2 |
| 5. S10863 01 03 W2 | 11. S10867 17 05 H2 |
| 6. S10880 01 03 B1 | 12. |

Field Supervisor [signature] — Date 11/23/85

Samples Collected 5 [illegible], 3 [illegible] SEDIMENT, 3 [illegible] SAMPLES

Field Supervisor [signature] — Date [illegible]

Samples Released to [illegible] — Time [illegible]

Laboratory ACUREX LAB — Date [illegible]

Samples Accepted [signature] — Time 1000

Laboratory — Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

Project Engineer



AV-F-[illegible]

ACUREX Corporation / AeroViro...ent Inc.

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8601-006

## SAMPLE HANDLING LOG

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JAN 10 1986
AeroVironment Inc.

Chain of Custody

Site PEALE AFB    AV Project No. 10416 K

Date 1/6/86    Acurex Project No.

Test Location SITES 4, 11, 10, 5    Sampler(s) TAYLOR/THURSTON/LOUDAHL/MILLER

SAMPLES:

1. 810884 04 01 01 VOA
2. 810885 04 01 01 METALS
3. 810886 04 01 01 O&G
4. 810887 04 01 01 PHENOLS
5. 810888 11 01 01 VOA
6. 810889 11 01 01 O&G
7. 810890 11 01 01 PHENOLS
8. 810896 10 01 01 VOA
9. 810897 10 01 01 O&G + PETROL. HC
10. 810898 10 01 01 PHENOL
11. 810899 05 01 01 VOA
12. 810900 05 01 01 O&G

Field Supervisor [signature]    Date 1/6/86
Samples Collected 12 GROUNDWATER SAMPLES - ANOTHER PHENOLS IMMED!

Field Supervisor [signature]    Date 1/6/86
Samples Released to GREYHOUND    Time 7:50 pm

Laboratory Acurex LAB    Date 1/7/86
Samples Accepted [signature]    Time 1000

Laboratory ____    Date ____
Samples Accepted ____

After Analysis Samples To Be:    Disposed of ____
Saved for Storage ____



Project Engineer ____

ACUREX Corporation / AeroViror. .ent Inc.

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# SAMPLE HANDLING LOG

## Chain of Custody

8601-006

Site BEALE AFB

AV Project No. 10416 K

Date 1/6/86

Acurex Project No.

Test Location -

Sampler(s) TAYLOR/THURSTON/LUNDAHL/MILLER

SAMPLES:

810901 05 01 01 PHENOLS

1.

7.

2.

8.

3.

9.

4.

10.

5.

11.

6.

12.

Field Supervisor [signature] Date 1/6/86

Samples Collected 1 GROUNDWATER SAMPLE - ANALYZE FOR PHENOLS IMMEDIATELY!

Field Supervisor [signature] Date 1/6/86

Samples Released to GRETENSTD Time 7:50 pm

Laboratory Acurex LAB Date 1/7/86

Samples Accepted [signature] Time 1000

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage



Project Engineer

ACUREX Corporation / AeroViro[nm]ent Inc.

)601-009 Sheet 1 of 2 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

RECEIVED
JAN 14 1986
AeroVironment Inc.

Site 2, 2R, 3 AV Project No. 10416K

Date 1/7/86 Acurex Project No.

Test Location Beale AFB Sampler(s) Lovdahl/Thurston/Miller

SAMPLES:

1. 810295 02 01 01 Metals
2. 810303 02 01 01 O+G
3. 810302 02 01 01 VOA
4. 810296 02R 04 01 VOA
5. 810297 ~~0~~2R 04 01 O+G
6. 810[illegible] 02R 04 01 BNA
7. 810297 02R 04 01 Metals
8. 810290 03 01 01 VOA
9. 810290 03 01 01 O+G Pet HC
10. 810300 03 01 01 Phenol
11. 810301 03 01 01 Pb
12. 

Field Supervisor Samples Collected Sheryl Thurston Date 1/7/86

Field Supervisor Samples Released to Greyhound Bus Lines (signed) Sheryl Thurston Date 1/7/86 Time 7:30 [illegible]

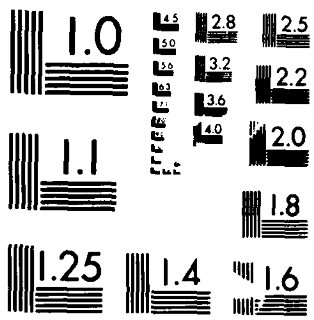
Laboratory [illegible] Samples Accepted [illegible] Date Time

Laboratory Samples Accepted

After Analysis Samples To Be: Disposed of ______ Saved for Storage ______

Project Engineer ______

AD-A183 482 INSTALLATION RESTORATION PROGRAM PHASE 2 3/8
CONFIRMATION/QUANTIFICATION STAG..(U) AEROVIRONMENT INC
MONROVIA CA R BAUER MAY 87 AV-FR-86/517R2
UNCLASSIFIED F33615-83-D-4000 F/G 24/4 NL




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

ACUREX Corporation / AeroViro. .ent Inc.

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# SAMPLE HANDLING LOG

## Chain of Custody

Site 8, 3, 2

AV Project No. 10416K

Date 1/7/86

Acurex Project No.

Test Location Beale AFB

Sampler(s) Lovdahl/Thurston/Miller

SAMPLES:

1. 810891 08 01 01 VOA
2. 810892 08 01 01 O+G, Pet HC
3. 810893 08 01 01 Phenol
4. 810894 03 02 01 VOA
5. 810895 03 02 01 O+G Pet, HC
6. 810292 03 02 01 Pb
7. 810293 03 02 01 Phenols
8. 810288 03 05 01 VOA
9. 810289 03 05 01 O+G, Pet HC
10. 810290 03 05 01 Pb
11. 810291 03 05 01 Phenol
12. 810294 02 01 01 BNA

Field Supervisor Samples Collected: Sheryl Thurston Date 1/7/86

Field Supervisor Samples Released to: Sheryl Thurston, Greyhound Bus Lines Date 1/7/86 Time 7:30pm

Laboratory Samples Accepted: [illegible] LAB, [illegible] Date 1/8/86 Time [illegible]

Laboratory Samples Accepted: Date

After Analysis Samples To Be: Disposed of / Saved for Storage



Project Engineer

ACUREX Corporation / AeroViro. ent Inc.

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## SAMPLE HANDLING LOG

Chain of Custody

2 COOLERS IN SHIPMENT

RECEIVED
JAN 14 1986
AeroVironment Inc.

Site 1

Date 1/8/86

Test Location Beale

AV Project No. 10416K

Acurex Project No.

Sampler(s) Loudahl/Miller/Thurston

SAMPLES:

1. 810441 01 02 Phenols 01
2. 810483 01 03 O+G 01
3. 810437 01 03 Phenols 01
4. 810436 01 03 Metals 01
5. 810442 01 04 VOA 01
6. 810443 01 04 O+G 01
7. 810444 01 04 Metals 01
8. 810445 01 04 Phenol 01
9. 810446 01 05 VOA 01
10. 810448 01 05 Metals 01
11. 810447 01 05 O+G 01
12. 810449 01 05 Phenol 01

Field Supervisor [signature] Date 1/8/86

Samples Collected 12 GROUNDWATER

Field Supervisor [signature] Date 1/8/86

Samples Released to 12 Groundwater Time 7:30

Laboratory ACUREX LAB Date 1/8/86

Samples Accepted [signature] Time 1015

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage



Project Engineer

ACUREX Corporation / AeroViro. ˋlent Inc.

Sheet 2 of 5 in this shipment

# SAMPLE HANDLING LOG

2 COOLERS

## Chain of Custody

Site ZR, 2, 1 AV Project No. 10416K

Date 1/8/86 Acurex Project No.

Test Location Beale Sampler(s) Thurston/Lordan // Miller

SAMPLES:

1. 810409 02R 02 01 O+G
2. 810410 02R 02 01 BNA
3. 810411 02R 02 01 Metals
4. 810412 02R 02 01 Phenols
5. 810415 02 01 01 Phenol
6. 810473 01 01 01 VOA
7. 810479 01 01 01 O+G
8. 810480 01 01 01 metals
9. 810481 01 01 01 Phenols
10. 810438 01 02 01 VOA
11. 810439 01 02 01 O+G
12. 810440 01 02 01 metals

Field Supervisor [signature] Date 1/8/86

Samples Collected 12 GROUNDWATER

Field Supervisor [signature] Date 1/8/86

Samples Released to GREYHOUND Time 7:30 pm

Laboratory ACUREX LAB Date 1/8/86

Samples Accepted [signature] Time 10:15

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

G-36

Project Engineer

ACUREX Corporation / AeroVironment Inc.

Sheet 3 of 5
in this shipment

2 COOLERS

# SAMPLE HANDLING LOG

## Chain of Custody

Site 1, 3, 2R, AV Project No. 10416K

Date 1/8/86 Acurex Project No.

Test Location Beale AFB Sampler(s) Thurston / Lundahl / Millier

SAMPLES:

| | | | | |
|---|---|---|---|---|
| 1. | 810482 | 01 | 03 | 01 VOA |
| 2. | 810400 | 03 | 03 | 01 VOA |
| 3. | 810401 | 03 | 03 | 01 O+G, Pet HC |
| 4. | 810402 | 03 | 03 | 01 Pb |
| 5. | 810403 | 03 | 03 | 01 Phenol |
| 6. | 810404 | 02R | 03 | 01 VOA |
| 7. | 810405 | 02R | 03 | 01 O+G |
| 8. | 810406 | 02R | 03 | 01 BNA |
| 9. | 810407 | 02R | 03 | 01 metals |
| 10. | 810414 | 02R | 03 | 01 Phenols |
| 11. | 810413 | 02R | 04 | 01 Phenols |
| 12. | 810408 | 02R | 02 | 01 VOA |

Field Supervisor [signature] Date 1/8/86
Samples Collected 12 Groundwater

Field Supervisor [signature] Date ~~7/25~~ 1/8/86
Samples Released to Greyhound Time 7:30 PM

Laboratory Acurex Lab Date 1/8/86
Samples Accepted [signature] Time 1015

Laboratory ______ Date ______
Samples Accepted ______

After Analysis Samples To Be: Disposed of ______
Saved for Storage ______



Project Engineer ______

ACUREX Corporation / AeroViro. .ent Inc.



# SAMPLE HANDLING LOG

2 COOLERS

## Chain of Custody

Site 1, 6 AV Project No. 10410 K

Date 1/8/86, Acurex Project No. ______

Test Location Beale AFB Sampler(s) Thurston/Lovdahl/ Miller

SAMPLES:

| | | | |
|---|---|---|---|
| 1. | 810450 01 06 01 VOA | 7. | 810457 01 09 01 Phenol |
| 2. | 810451 01 06 01 ORG | 8. | 810456 01 09 01 metals |
| 3. | 810452 01 06 01 metals | 9. | 810421 26 06 01 VOA |
| 4. | 810453 01 06 01 Phenols | 10. | 810422 |
| 5. | 810454 01 09 01 VOA | 11. | 810423 01 |
| 6. | 810455 01 09 01 ORG | 12. | 810420 |

Field Supervisor [signature] Date 1/8/86

Samples Collected 1-12 [illegible]

Field Supervisor [signature] Date 1/8/86

Samples Released to GREYHOUND Time 7:30 p

Laboratory Acurex Lab Date 1/8/86

Samples Accepted [signature] Time 1015

Laboratory ______ Date ______

Samples Accepted ______

After Analysis Samples To Be: Disposed of ______

Saved for Storage ______



Project Engineer ______

ACUREX Corporation / AeroViro[illegible]ent Inc.

Sheet 5 of 5 in this shipment

## SAMPLE HANDLING LOG

**Chain of Custody**

2 COOLERS

Site 6 AV Project No. 10416K

Date 1/8/86 Acurex Project No.

Test Location Beale AFB Sampler(s) Lovdahl/Thurston/Miller

**SAMPLES:**

1. 810417 06 05 01 O+G
2. 810419 06 05 01 Phenols
3. 810416 06 05 01 VOA
4. 810418 06 05 01 Metals
5.
6.
7.
8.
9.
10.
11.
12.

Field Supervisor [illegible] Date 1/8/86

Samples Collected 4 GROUNDWATER

Field Supervisor [illegible] Date 1/8/86

Samples Released to GREYHOUND Time 7:50 PM

Laboratory Acurex Lab Date 1/9/86

Samples Accepted [illegible] Time 1015

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage



Project Engineer

ACUREX Corporation / AeroVir nent Inc.

Sheet 1 of 3
in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

8601-026

Site 3 15 17 13 AV Project No. 10416K

Date 1 19 83 Acurex Project No.

Test Location Beale AFB - Sampler(s) Miller/[illegible]/[illegible]

**SAMPLES:**

| | |
|---|---|
| 1. 810424 03 C4 01 VOA | 7. 810464 15 01 Metals 01 |
| 2. 810453 17 01 S1 O+G | 8. 810435 15 01 Phenols 01 |
| 3. 810426 C3 04 01 Pb | 9. 810470 13 01 S1 VOA |
| 4. 810427 03 04 Phenols 01 | 10. 810463 15 02 Phenols 01 |
| 5. 810428 15 01 C1 VOA | 11. 810472 13 02 S1 VOA |
| 6. 810453 17 01 S1 VOA | 12. 810462 15 02 Metals 01 |

Field Supervisor [illegible] Date [illegible]
Samples Collected [illegible]

Field Supervisor [illegible] Date [illegible]
Samples Released to [illegible] Time 7 30 [illegible]

Laboratory Acurex Lab Date 1/10/86
Samples Accepted [signature] Time 1500

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-HV91

ACUREX Corporation / AeroVir ment Inc.

Sheet 2 of 3
in this shipment

# SAMPLE HANDLING LOG

8601-026

## Chain of Custody

Site 13, 15, 6 AV Project No. 10410K

Date 9/86 Acurex Project No.

Test Location Reese AFB Sampler(s) M er/Loldahl/Thurston

**SAMPLES:**

| | |
|---|---|
| 1. 810474 13 03 S1 VOA | 7. 810468 15 03 01 metals |
| 2. 810486 15 04 01 metal | 8. 810469 15 03 phenols |
| 3. 810476 13 04 S1 VOA | 9. 810460 15 02 01 VOA |
| 4. 810487 15 04 01 Phenol | 10. 810491 06 01 01 phenols |
| 5. 810466 15 03 01 VOA | 11. 810490 06 01 01 metals |
| 6. 810484 15 04 01 VOA | 12. 810483 06 01 01 VOA |

Field Supervisor Samples Collected [illegible] Date [illegible]

Field Supervisor [illegible] Date [illegible]
Samples Released to [illegible] Time 7:30 pm

Laboratory Acurex Date 1/10/86
Samples Accepted [signature] Time 1500

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-HW01

ACUREX Corporation / AeroVir ment Inc.

Sheet 3 of 3 in this shipment

# SAMPLE HANDLING LOG

8601-024

## Chain of Custody

Site 3, 13, 6, 15 RECEIVED AV Project No. 10416K

Date 1/9/86 JAN 15 1986 Acurex Project No.

Test Location Beale AeroVironment Inc. Sampler(s) Miller / Lordan / Thurston

SAMPLES:

1. 810492 03 06 01 VOA
2. 810493 03 06 01 O+G
3. 810494 03 06 01 PHS
4. 810495 03 06 01 METALS
5. 810471 13 01 S1 O+G
6. 810489 06 01 01 O+G
7. 810434 15 01 01 O+G
8. 810467 15 03 01 O+G
9. 810473 13 02 S1 O+G
10. 810485 15 04 01 O+G
11.
12.

Field Supervisor [illegible] Date 1-10-86
Samples Collected

Field Supervisor [illegible] Date 1-10-86
Samples Released to [illegible] Time 7:30 pm

Laboratory Acurex Lab Date 1/10/86
Samples Accepted [signature] Time 1500

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

Project Engineer



AV-F-HW01

ACUREX Corporation / AeroVironment Inc.

Sheet 4 of 5 in this shipment

NOTE → 1 of 5, 2 of 5, 3 of 5 are Mather

# SAMPLE HANDLING LOG

## Chain of Custody

Site: BEALE AFB

AV Project No.: 10416 K

Date: 1/10/86

Acurex Project No.:

Test Location: SITE 13 - LF1

Sampler(s): MILLER/LONBACH/HANSON

SAMPLES:

| | | | |
|---|---|---|---|
| 1. | 810497 13 01 01 O+G | 7. | 810505 13 02 01 Herb/Pest. |
| 2. | 810498 13 01 01 Metals | 8. | 810507 13 02 01 O+G |
| 3. | 810499 13 01 01 Pest/Herb | 9. | 810500 13 03 01 VOA |
| 4. | 810496 13 01 01 VOA | 10. | 810871 13 03 01 Pest Herb |
| 5. | 810503 13 02 01 METALS | 11. | 810501 13 03 01 O+G |
| 6. | 810508 13 02 01 VOA | 12. | 810465 13 03 01 Metals |

Field Supervisor: [signature] Date: 1/10/86

Samples Collected: 12 WATER SAMPLES

Field Supervisor: [signature] Date: 1/12/86

Samples Released to: GREYHOUND Time: 9:30 AM

Laboratory: Acurex Lab Date: 1/13/86

Samples Accepted: [signature] Time: 1030

Laboratory: Date:

Samples Accepted:

After Analysis Samples To Be: Disposed of
Saved for Storage



Project Engineer:

ACUREX Corporation / AeroVironment Inc.

Sheet 5 of _
in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site BEALE AFB IRP
AV Project No. 10416 K
Date 1/10/86
Acurex Project No.
Test Location SITES 13, 3, 6, 15
Sampler(s) [illegible] / [illegible] / [illegible]

SAMPLES:

1. 810475 13 03 S1 OTG
2. 810477 13 04 S1 OTG
3. 810425 03 04 OTG, [illegible] HC
4. 810502 06 02 01
5. 810504 06 02 01
6. 810503 06 02 01
7. 810461 15 02 01 OTG
8.
9.
10.
11.
12.

Field Supervisor [signature] Date 1/10/86
Samples Collected 7 WATER SAMPLES

Field Supervisor [signature] Date 1/12/86
Samples Released to [illegible] Time

Laboratory Acurex LAB Date 1/13/86
Samples Accepted Efren A. [signature] Time 1030

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

G-44

Project Engineer

ACUREX Corporation / AeroVirr ment Inc.

Sheet 1 of 1 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

8601-027

Site BEALE AFB AV Project No. 10416 K

Date 1/10/86 Acurex Project No.

Test Location LANDFILL #2 (SITE 3) Sampler(s) MILLER/LINDAHL

**SAMPLES:**

1. 810505 06 02 01 PHENOLS
2. 
3. 
4. 
5. 
6. 
7. 
8. 
9. 
10. 
11. 
12. 

RECEIVED JAN 1

AeroVironment Inc.

Field Supervisor [signature] Date 1/10/86

Samples Collected 1 GROUNDWATER FOR PHENOLS (420.1) ANALYZE IMMEDIATELY

Field Supervisor [signature] Date 1/10/86

Samples Released to FEDERAL EXPRESS Time 3:45 pm

Laboratory Acurex Lab Date 1/13/86

Samples Accepted Efren A. Jabla[signature] Time

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

Project Engineer



AV-F-4701

ACUREX Corporation / AeroVironment Inc.

Sheet 1 of 2 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB — AV Project No. 10416K

Date 4/14/86 — Acurex Project No.

Test Location Sites 1 & 3 — Sampler(s) Lovdahl/Thurston/O'Gara

SAMPLES:

| | | | | | |
|---|---|---|---|---|---|
| 1. | 906055 | 01 | 01 | G1 | VOA |
| 2. | 906056 | 01 | 01 | G1 | O+G |
| 3. | 906058 | 01 | 01 | G1 | Metal |
| 4. | 906059 | 01 | 01 | G1 | Phenol |
| 5. | 906057 | 01 | 02 | G1 | O+G |
| 6. | 906060 | 03 | 03 | G1 | VOA |
| 7. | 906061 | 03 | 03 | G1 | O+G Pet HC |
| 8. | 906062 | 03 | 03 | G1 | Phenol |
| 9. | 906063 | 03 | 03 | G1 | TD |
| 10. | 906064 | 03 | 04 | G1 | VOA |
| 11. | 906065 | 03 | 04 | G1 | O+G Pet HC |
| 12. | 906066 | 03 | 04 | G1 | Phenol |

Field Supervisor Sheryl A Thurston — Date 4/14/86

Samples Collected Groundwater samples - 12

Field Supervisor Sheryl A Thurston — Date 4/14/86

Samples Released to Greyhound Bus Lines — Time 7:30 pm

Laboratory Acurex LMB — Date 4/16/86

Samples Accepted Efren S. Saklan — Time 0940

Laboratory — Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

ACUREX Corporation / AeroVironment Inc.

Sheet 2 of 2 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB    AV Project No. 10416K

Date 4/14/86    Acurex Project No.

Test Location Site 183    Sampler(s) Lordani/Thurston/O'Gara

SAMPLES:

1. 906067 03 04 G1 Pb
2. 906068 03 04 G2 Pb
3. 906069 03 01 G1 VOA
4. 906070 03 01 G1 O+G, Pet HC
5. 906071 03 01 G1 Phenol
6. 906072 03 01 G1 Pb
7.
8.
9.
10.
11.
12.

Field Supervisor Sheryl Thurston    Date 4/14/86

Samples Collected 6 Groundwater Samples

Field Supervisor Sheryl Thurston    Date 4/14/86

Samples Released to Greyhound Bus Lines    Time 7:30pm

Laboratory Acurex LAB    Date 4/16/86

Samples Accepted Efren Saldan    Time 0940

Laboratory    Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

ACUREX Corporation / AeroVironment Inc.

8604-039 Sheet 2 of 4 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site: Beale AFB — AV Project No.: 10416K

Date: 4/15/86 — Acurex Project No.:

Test Location: Site 3, 6 — Sampler(s): Lordahl / Thurston / O'Gara

SAMPLES:

| No. | Sample | | | | No. | Sample | | | |
|---|---|---|---|---|---|---|---|---|---|
| 1. | 906073 | 03 | 02 | G1 VOA | 7. | 906081 | 03 | 05 | G1 Phenol |
| 2. | 906074 | 03 | 02 | G1 Org, Pet HC | 8. | 906082 | 03 | 05 | G1 Pb |
| 3. | 906075 | 03 | 02 | G1 Phenol | 9. | 906083 | 06 | 01 | G1 601/602 VOA |
| 4. | 906076 | 03 | 02 | G1 Pb | 10. | 906084 | 06 | 01 | G1 Org |
| 5. | 906079 | 03 | 05 | G1 VOA | 11. | 906077 | 06 | 01 | G1 Metals |
| 6. | 906080 | 03 | 05 | G1 Org, Pet HC | 12. | 906078 | 06 | 01 | G1 Phenols |

Field Supervisor: Sheryl Thurston — Date: 4/16/86
Samples Collected: 12 Groundwater

Field Supervisor: Sheryl Thurston — Date: 4/16/86
Samples Released to: Greyhound Bus Lines — Time: 8 am

Laboratory: Acurex Lab — Date: 4/17/86
Samples Accepted: Efren A. Jacklan — Time: 1030

Laboratory: — Date:
Samples Accepted:

After Analysis Samples To Be: Disposed of ______ Saved for Storage ______

ACUREX Corporation / AeroVironment Inc.

8604-039 Sheet 2 of 4 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB AV Project No. 10416K

Date 4/16/86 Acurex Project No.

Test Location Site 15, 6 Sampler(s) Lovdahl / Thurston / O'Hara

SAMPLES:

1. 906037 06 01 G1 Pest/Herb
2. 906038 06 02 G1 601/602
3. 906039 06 02 G1 O+G
4. 906040 06 02 G1 Metals
5. 906041 06 02 G1 Phenols
6. 906042 06 02 G1 Pest/Herb
7. 906043 15 04 G1 601/602
8. 906044 15 04 G1 O+G
9. 906045 15 04 G1 Metals
10. 906046 15 04 G1 Phenols
11. 906047 15 04 G1 Pest/Herb
12. 906048 15 05 G1

Field Supervisor Sheryl Thurston Date 4/16/86
Samples Collected 12 Groundwater

Field Supervisor Sheryl Thurston Date 4/16/86
Samples Released to Greyhound Bus Lines Time 8 am

Laboratory Acurex Lab Date 4/17/86
Samples Accepted [signature] Time 1030

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

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ACUREX Corporation / AeroVironment Inc.

86-039

Sheet 3 of 4 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB AV Project No. 10416K

Date 4/15/86 Acurex Project No.

Test Location Site 15 Sampler(s) Lovdahl/Thurston/O'Gara

SAMPLES:

1. 906085 15 02 G1 (G01/G02 VOA)
2. 906086 15 02 G1 (O+G)
3. 906087 15 02 G1 (Metals)
4. 906088 15 02 G1 (Phenol)
5. 906089 15 02 G1 (Pest/Herb)
6. 906090 15 03 G1 (O+G)
7. 906091 15 03 G1 (G01/G02)
8. 906092 15 03 G1 (Metals)
9. 906093 15 03 G1 (Phenol)
10. 906094 15 03 G1 (Pest/Herb)
11. 906095 15 03 G1 (Herb)
12. 906096 15 01 G1 (G01/G02)

Field Supervisor Sheryl Thurston Date 4/16/86
Samples Collected 12 Groundwater

Field Supervisor Sheryl Thurston Date 4/16/86
Samples Released to Greyhound Bus Lines Time 8 am

Laboratory Acurex Lab Date 4/17/86
Samples Accepted [signature] Time 1030

Laboratory Date
Samples Accepted

After Analysis Samples To Be: Disposed of
G-50 Saved for Storage

ACUREX Corporation / AeroVironment Inc.

3604-039 Sheet 4 of 4 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB AV Project No. 10416K

Date 4/16/86 Acurex Project No.

Test Location Site 15 Sampler(s) Lordaine/Murston/O'Gara

SAMPLES:

1. 906097 15 01 G1 OrG
2. 906098 15 01 G1 Metals
3. 906099 15 01 G1 Phenol
4. 906100 15 01 G1 Herb
5. 906101 15 01 G1 Pesticides
6.
7.
8.
9.
10.
11.
12.

Field Supervisor [signature] Murston Date 4/16/86

Samples Collected 5 groundwater

Field Supervisor [signature] Murston Date 4/16/86

Samples Released to Greyhound Bus Lines Time 8 am

Laboratory Acurex LAB Date 4/17/86

Samples Accepted [signature] Time 1030

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

G-51 Saved for Storage

ACUREX Corporation / AeroVironment Inc.

3604-041

Sheet 1 of 6 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB | AV Project No. 10416K

Date 4/16/86 | Acurex Project No.

Test Location Site 13 | Sampler(s) Loudahl/O'Gara/Thurston

SAMPLES:

| | | | | |
|---|---|---|---|---|
| 1. | 906130 | 13 | 01 | Pest/Herb G1 |
| 2. | 906129 | 13 | 01 | Metals G1 |
| 3. | 906127 | 13 | 01 | 601/602 G1 |
| 4. | 906125 | 13 | 01 | O+G G1 |
| 5. | 906131 | 13 | 01 | Phenol G1 |
| 6. | 906139 | 13 | 02 | 601/602 G1 |
| 7. | 906140 | 13 | 02 | O+G G1 |
| 8. | 906141 | 13 | 02 | Metals G1 |
| 9. | 906142 | 13 | 02 | Pest/Herb G1 |
| 10. | 906143 | 13 | 02 | Phenols G1 |
| 11. | 906144 | 13 | 03 | 601/602 G1 |
| 12. | 906132 | 13 | 03 | O+G G1 |

Field Supervisor Sheryl Thurston | Date 4/16/86
Samples Collected 12 water samples

Field Supervisor Sheryl Thurston | Date 4/17/86
Samples Released to Greyhound Bus Lines | Time 8:30 am

Laboratory Acurex LAB | Date 4/18/86
Samples Accepted [illegible signature] | Time 0945

Laboratory | Date
Samples Accepted

After Analysis Samples To Be: Disposed of
Saved for Storage

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ACUREX Corporation / AeroVir...ment Inc.

~~~U34-041

Sheet 2 of 6 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB

AV Project No. 10416K

Date 4/16/86

Acurex Project No.

Test Location Site 13

Sampler(s) Laidahl/O'Gara/Thurston

SAMPLES:

| | Sample | Site | Loc. | Analysis / Code |
|---|---|---|---|---|
| 1. | 906133 | 13 | C3 | Metals G1 |
| 2. | 906102 | 13 | 03 | Pest/Herb G1 |
| 3. | 906246 | 13 | 01 | Cor/602 W2 |
| 4. | 906247 | 13 | 01 | OT4 W2 |
| 5. | [illegible] | 13 | 01 | Metals W2 |
| 6. | 906249 | 13 | 01 | Pest/Herb W2 |
| 7. | 906250 | 13 | 01 | Phenol W2 |
| 8. | 906241 | 13 | 02 | VOA W2 |
| 9. | 906242 | 13 | 02 | OT6 W2 |
| 10. | [illegible] | 13 | 02 | Metals W2 |
| 11. | [illegible] | 13 | C2 | Herb/Pest W2 |
| 12. | 906245 | 13 | 02 | Phenol W2 |

Field Supervisor Sheryl Thurston Date 4/26/86

Samples Collected 12 water samples

Field Supervisor Sheryl Thurston Date 4/17/86 / 8:30am

Samples Released to Greyhound Bus Lines Time /

Laboratory Acurex Lab Date 4/18/86

Samples Accepted [signature] Time 0945

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

G-53 Saved for Storage
~~~

ACUREX Corporation / AeroVironment Inc.

360'-041

Sheet 3 of 6 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale | AV Project No. 10416K

Date 4/16/86 | Acurex Project No.

Test Location Site 13, 10 | Sampler(s) Lovdahl/Thurston/O'K...

SAMPLES:

| | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| 1. | 906145 | 13 | 03 | W2 VOA | 7. | 906135 | 13 | 04 | W2 |
| 2. | 906146 | 13 | 03 | W2 OPC | 8. | 906136 | 13 | 04 | W2 Phenol |
| 3. | 906147 | 13 | 03 | W2 Phen | 9. | 906137 | 13 | 04 | W2 Sol |
| 4. | [illegible] | 13 | 03 | W2 MET | 10. | [illegible] | 13 | 04 | W2 MET |
| 5. | [illegible] | 13 | 03 | W2 Sol | 11. | [illegible] | 10 | 01 | H1 |
| 6. | [illegible] | 13 | 04 | W2 | 12. | 906103 | 10 | 01 | H2 |

Field Supervisor Mary Thurston Date 4/16/86

Samples Collected groundwater, surface water & soils

Field Supervisor Mary Thurston Date 4/17/86

Samples Released to Greyhound Bus Lines Time 8:30 am

Laboratory Lancaster Labs Date 4/18/86

Samples Accepted Efren N. Hollan Time 0945

Laboratory ______ Date ______

Samples Accepted ______

After Analysis Samples To Be: Disposed of ______ Saved for Storage ______

ACUREX Corporation / AeroVironment Inc.

8604-041 Sheet 4 of 6 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AV Project No. 10416K

Date 4/16/86 Acurex Project No.

Test Location Sampler(s) Lovdahl/Thurston/O'Rourke

SAMPLES:

| | |
|---|---|
| 1. 906103 10 02 A1 | 7. 906170 17 01 W2 |
| 2. 906104 10 02 A2 | 8. 906171 17 01 W2 |
| 3. 906121 10 02 H1 | 9. 906172 17 01 W2 |
| 4. 906122 10 02 H1 | 10. 906173 17 01 W2 |
| 5. 906123 10 02 A2 | 11. 906161 11 01 G1 C+G |
| 6. 906150 02 RL G1 601/602 | 12. 906160 11 01 G1 601/602 |

Field Supervisor Amye Thurston Date 4/16/86

Samples Collected groundwater, surface water, soil

Field Supervisor Amye Thurston Date 4/17/86

Samples Released to Greyhound Bus Lines Time 7:30 am

Laboratory [illegible] Date 4/18/86

Samples Accepted [illegible] Time [illegible]

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

G-55 Saved for Storage

ACUREX Corporation / AeroVir...ment Inc.

3604-041

Sheet 5 of 6 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB — AV Project No. 10416K

Date 4/16/86 — Acurex Project No.

Test Location Site 10, 11, 2 — Sampler(s) Lordaine / Thurston / O'Gara

SAMPLES:

| | Sample | Site | | Type | | | Sample | Site | | Type |
|---|---|---|---|---|---|---|---|---|---|---|
| 1. | [illegible] | 11 | 01 | G1 (Phenols) | | 7. | 906154 | 02 | 01 | G1 (Metals) |
| 2. | 906157 | 10 | 01 | G1 (601/602) | | 8. | 906152 | 02 | 01 | G1 (601/602) |
| 3. | 906159 | 10 | 01 | G1 (Phenol) | | 9. | 906153 | 02 | 01 | G1 (O+G) |
| 4. | [illegible] | 10 | 01 | G1 (Pet H. O+G) | | 10. | [illegible] | 02 | 01 | G1 (BNA) |
| 5. | [illegible] | 11 | 02 | G1 (O+G) | | 11. | [illegible] | 02 | R1 | G1 (BNA) |
| 6. | [illegible] | 11 | 02 | G1 (601/602) | | 12. | [illegible] | 02 | R1 | G1 (O+G) |

Field Supervisor [signature] Thurston — Date 4/16/86

Samples Collected 12 groundwater

Field Supervisor [signature] Thurston — Date 4/17/86

Samples Released to 4 Greyhound Bus Lines — Time 8:30 am

Laboratory [illegible] LAB — Date 4/18/86

Samples Accepted [signature] — Time 0945

Laboratory — Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

ACUREX Corporation / AeroVir...nent Inc.

860-041

Sheet 6 of 6 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB

AV Project No. 10416K

Date 4/16/86

Acurex Project No.

Test Location Site 2

Sampler(s) Lovdahl/Thurston/O'Gr...

SAMPLES:

1. 300232 ✓02 R1 Metals G1
7.
2.
8.
3.
9.
4.
10.
5.
11.
6.
12.

Field Supervisor Sherry Thurston Date 4/16/86

Samples Collected 1 groundwater sample

Field Supervisor Sherry Thurston Date 4/17/86

Samples Released to Greyhound Bus Lines Time 8:00am

Laboratory Acurex Lab Date 4/18/86

Samples Accepted [illegible] Time 0945

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

ACUREX Corporation / AeroViro ient Inc.

Sheet ___ of 6
in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site BEALE AFB AV Project No. 

Date 4/17/86 Acurex Project No.

Test Location Test Location Sampler(s) 

SAMPLES:

| | | | | | |
|---|---|---|---|---|---|
| 1. | 906196 | 7. | 906174 | 8 | 01 |
| 2. | 906193 | 8. | 906208 | 01 | 01 |
| 3. | 906194 | 9. | 906210 | | |
| 4. | 906195 | 10. | 906209 | | |
| 5. | 906175 8 01 | 11. | 906207 | | |
| 6. | 906177 8 | 12 | 906179 | | |

Field Supervisor ___ Date ___

Samples Collected ___

Field Supervisor ___ Date 4/18/86

Samples Released to ACUREX Time 4:45 pm

Laboratory ___ Date ___

Samples Accepted ___ Time ___

Laboratory ___ Date ___

Samples Accepted ___

After Analysis Samples To Be: Disposed of ___
Saved for Storage ___

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Project Engineer ___

ACUREX Corporation / AeroViro. .ient Inc.

Sheet 7 of 6 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site [illegible]  AV Project No. [illegible]

Date [illegible]  Acurex Project No.

Test Location [illegible]  Sampler(s) [illegible]

SAMPLES:

1. 906180 04 01 G1 Phenol
2. 906178 04 01 G1 [illegible]
3. 906177 04 01 G1 601/602
4. 906125 [illegible] [illegible] 22 MET
5. 906126 [illegible] [illegible] 22 [illegible]
6. [illegible]
7. 906199 02 [illegible] [illegible]
8. 906202 02 02 G1 [illegible]
9. 906200 02 [illegible] [illegible]
10. 906192 [illegible] [illegible] [illegible]
11. 906194 [illegible] [illegible] N2 [illegible]
12. 906193 01 01 N2 [illegible]

Field Supervisor [signature]  Date 4/17/86

Samples Collected 10 WATER SAMPLES, 2 SOIL SAMPLES (FOR EP TOX AND TOTAL MET(S))

Field Supervisor [signature]  Date 4/18/86

Samples Released to ACUREX  Time 9:45 am

Laboratory [illegible]  Date [illegible]

Samples Accepted [signature]  Time [illegible]

Laboratory  Date

Samples Accepted

After Analysis Samples To Be: Disposed of

G-59 Saved for Storage

Project Engineer

ACUREX Corporation / AeroViro...nent Inc.

Sheet 3 of 3
in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site Beale AFB

AV Project No. 10016

Date 4/?/90

Acurex Project No.

Test Location [illegible]

Sampler(s) [illegible]

**SAMPLES:**

1. 906131 01 01 601/602 W2
2. 906133 01 02 Phenol W2
3. 906135 01 02 601/602 W2
4. 906137 01 02 Metals W2
5. 906... 01 02 W2
6. 906110 01 03 W2
7. 906191 01 03 Metals W2
8. 906139 01 03 601/602 W2
9. 906192 01 02 Phenol W2
10. 906210 22 03 Metals G1
11. 9062... 22 03 BNA G1
12. 906204 22 3 G1

Field Supervisor [illegible] Date [illegible]

Samples Collected 12 water samples

Field Supervisor [illegible] W. [illegible] Date 4/18/90

Samples Released to Acurex Time 4:45

Laboratory [illegible] Date [illegible]

Samples Accepted [illegible] Time [illegible]

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

ACUREX Corporation / AeroVironment Inc.

Sheet 4 of 6 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site BEALE AFB AV Project No. 1041G K

Date 4/17/86 Acurex Project No.

Test Location RADIAN WORKS Sampler(s) LOUDAHL/OGARA

SAMPLES:

1. 906203 R2 03 G1 VOA ✓
2. 906213 R2 04 G1 VOA ✓
3. 906214 R2 04 G1 O&G ✓
4. 906215 R2 04 G1 BNA ✓
5. 906216 R2 04 G1 METAL ✓
6.
7.
8.
9.
10.
11.
12.

Field Supervisor [signature] Date 4/17/86

Samples Collected 5 WATER SAMPLES

Field Supervisor [signature] Date 4/17/86

Samples Released to ACUREX Time

Laboratory ACUREX LAB Date 4/18/86

Samples Accepted [signature] Time 1700

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

ACUREX Corporation / AeroViro. .ent Inc.

Sheet 5 of 6 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site BEALO AFB AV Project No. 10116K

Date 4/18/86 Acurex Project No.

Test Location SITE 1, SITE 5 Sampler(s) LOVDAHL/TAYLOR/OGARA

SAMPLES:

| | | | |
|---|---|---|---|
| 1. 906218 01 03 G2 Oil & grease ✓ | 7. 906115 05 01 G2 COD/NO3 ✓ |
| 2. 906120 01 06 W2 phenol | 8. 906217 01 03 G2 VOA ✓ |
| 3. 906221 01 03 G2 phenol | 9. 906116 05 01 G2 O&G ✓ |
| 4. 906219 01 03 G2 BNA ✓ | 10. 906119 01 05 W2 phenol |
| 5. 906118 01 04 W2 phenol | 11. 906220 01 03 G2 pest/herb ✓ |
| 6. 906117 05 01 G2 phenol | 906222 01 03 G2 metals ✓ |

Field Supervisor [signature] Date 4/18/86

Samples Collected 12 WATER SAMPLES - SURFACE & GW.

Field Supervisor [signature] Date 4/18/86

Samples Released to ACUREX Time 4:45

Laboratory Acurex Labs Date 4/18/86

Samples Accepted Efren W Jeller Time 1710

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage



Project Engineer

ACUREX Corporation / AeroViro...ent Inc.

Sheet 6 of 6
in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site BEALE AFB AV Project No. 1041GE

Date 4/18/96 Acurex Project No.

Test Location BASE PRODUCTION WELLS Sampler(s) PRUSS

SAMPLES:

1. BP 3-G2 - 1) 601/602 2) OIL & GREASE 3) PHENOLS 4) METALS (8 EP TOX.)
2. BP 2-G2 - 1) 601/602 2) OIL & GREASE 3.) PHENOLS 4) METALS (8 EP TOX)
3. BP 9-G2 1) 601/602 2) OIL & GREASE 3) PHENOLS 4) METALS (8 EP. TOX)
4. BP 4-G2 1) 601/602 2) OIL & GREASE 3) PHENOLS 10. 4) METALS (8 EP TOX)
5. BP 5-G2 1) 601/602 2) OIL & GREASE 3) PHENOLS 11. 4) METALS (8 E.P. TOX
6. BP 6-G2 1) 601/602 2) OIL & GREASE 3) PHENOLS 12. 4) METALS (8 EP TOX)

Field Supervisor [signature] Date 4/18/96

Samples Collected 6 SAMPLES ; 4 BOTTLES PER SAMPLE TOTAL 24

Field Supervisor [signature] Date 4/18/96

Samples Released to ACUREX Time 4:45 pm

Laboratory ACCULAB LAB Date 4/18/96

Samples Accepted [signature] Time 1700

Laboratory Date

Samples Accepted

After Analysis Samples To Be: Disposed of

Saved for Storage

## APPENDIX H

Laboratory Data

## H. LABORATORY DATA

### H.1 Using the Laboratory Reports

This appendix contains all sample analytical data collected during the course of this project in the form of original laboratory reports. All but two reports were generated by the Acurex laboratory, and are arranged numerically by laboratory report number. The report number appears at the top right corner of each page (see Figure H-1).

The data are organized in the reports by analytical parameter, and are reported under the six-digit integer sample ID number (referred to as Acurex # in soil results tables). Volatile organics, pesticides, herbicides, PCB's, metals and general chemistry (oil and grease, phenolics, petroleum hydrocarbons) results are presented in separate sections in each report. Therefore, in order to reseach all results for a particular sample, the reader must refer to each section which applies to the sample (typically four or five).

Each soil sample has one sample ID number, thus each parameter is reported using the same number. Water samples have a different sample ID for each parameter (except for the pairs 601/602 and oil & grease/petroleum hydrocarbons, which are reported using the same sample number). For example, the first round ground water sample from well number 03-01 has the following sample ID numbers: 810298 (601/602), 810299 (oil & grease, petroleum hydrocarbons), 810300 (phenolics), and 810301 (lead). This sample number information for ground water and surface water samples is presented in the footnotes of the results tables in Chapter 4. No cross-reference information is given in the laboratory reports.

In order to retrieve data from the laboratory reports, the reader must determine the sample ID number(s), the laboratory report number(s) and the page number in Appendix H at which the data begins. This information is provided in the results tables in Chapter 4. The results for the desired samples may then be found, along with the analysis dates and surrogate recoveries (where applicable) on the same report page. Detection limits and laboratory quality control sample results are included at the end of each section, following sample results.

Confirmation results for chromatographic analyses are reported with the sample results. For samples exceeding confirmation criteria but not detected by second-column or GC/MS confirmation analysis, the reported value is "ND", flagged with a footnote which reports the original result. Samples for which compounds are confirmed at the same level as the original result are flagged with a footnote stating that the result was confirmed. Samples for which compounds are confirmed at a different concentration are reported using the original result, with the confirmation analysis result appearing in parentheses next to the

original value.

Analytical Research Laboratories, Inc. performed explosives analysis on a composite of sample ID numbers 810860-810862. The results of this analysis are presented in report number 125114 on page H-381. Thermo Analytical, Inc. (formerly Analytical Research Laboratories, Inc.) performed toluene analysis on a water sample prepared with electrical tape and ultrapure water to identify the contamination potential of the tape. These results are presented in Report 86-04-055 on page H-380.

FIGURE H-1

TYPICAL LAB REPORT

LAB REPORT NUMBER

PARAMETER BEING REPORTED

AeroVironment
8601-028
Page 6 of [illegible]

SAMPLE NUMBER

Table 1. 601 Results
(Concluded)

DETECTION LIMITS

TYPICAL RESULT REQUIRING 2nd COLUMN CONFIRMATION WITH NOTATION

ANALYSIS DATE

| Sample ID#: | 811586 | 811590 | 811594 | 811577 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Chloromethane | ND | ND | ND | ND | 0.08 |
| Bromomethane | ND | ND | ND | ND | [illegible] |
| Dichlorodifluoromethane | ND | ND | ND | ND | [illegible] |
| Vinyl chloride | ND | ND | ND | ND | [illegible] |
| Chloroethane | ND | ND | ND | ND | [illegible] |
| Methylene chloride | 1.8* | 0.8* | 0.7* | 0.9* | [illegible] |
| Trichlorofluoromethane | ND | ND | ND | ND | [illegible] |
| 1,1-DCE | ND | ND | ND | ND | 0.1 |
| 1,1-DCA | ND | ND | ND | ND | [illegible] |
| trans-1,2-DCE | ND | 11** | 7.3 | ND | 0.1 |
| Chloroform | ND | ND | 0.38 | 0.21 | 0.05 |
| 1,2-DCA | ND | ND | ND | ND | 0.03 |
| 1,1,1-TCA | ND | ND | ND | 0.15 | 0.03 |
| Carbon tetrachloride | ND | ND | ND | ND | 0.1 |
| Bromodichloromethane | ND | ND | ND | ND | 0.1 |
| 1,2-Dichloropropane | ND | 0.24 | 0.23 | ND | 0.04 |
| trans-1,3-Dichloropropane | ND | ND | ND | ND | 0.3 |
| TCE | ND | 1.5** | 2.4** | ND | 0.1 |
| Dibromochloromethane[a] | | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND | 0.2 |
| cis-1,3-Dichloropropane[a] | | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND | 0.1 |
| Bromoform | ND | ND | ND | ND | 0.2 |
| Tetrachloroethane[b] | ND | 9.7** | 5.7** | ND | 0.3 |
| Tetrachloroethene[b] | | | | | |
| Chlorobenzene | ND | ND | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND. | ND | ND | 0.3 |
| Surrogate Recovery, % | 103 | 80 | 97 | 88 | |
| Analysis Date: | 1/15/86 | 1/15/86 | 1/15/86 | 1/15/86 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level
** - Confirmed by GC/MS Method 624 (For PCA/PCE, only PCE found)

ACUREX Corporation

Aerovironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

December 11, 1985
Acurex ID#: 8510-048
Page 1 of 27

Attention: Chris Lovedahl

Subject: Twenty-two Soils for Analysis; Received 10/25/85
Revised Report

Selected samples were analyzed following EPA method 8010 using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1. QC results for Method 8010 are presented in Table 2.

Selected samples were analyzed following EPA Method 8020 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 8020 are presented in Table 4.

Selected samples were analyzed for pesticides following Method 509A and herbicides following Method 509B (Standard Methods for the Examination of Water and Wastewater, 16th edition). A 3% OV-1 column was employed as the primary column for pesticides. A 30 meter DB1 fused silica column was used as the primary column for the herbicides. Samples for pesticide analysis were sonicated in 15% methylene chloride/hexane, concentrated, and then injected into a gas chromatograph operated isothermally. Detection of the eluting compounds were performed with an electron capture detector. Samples for herbicide analysis were extracted with diethyl ether and the extract hydrolyzed. The herbicide acids were methylated and then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of the pesticides and herbicides. Results of the 509A analyses are presented in Table 5 with QC results in Table 6. Results of the 509B analyses are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for oil and grease by sonicating the soil in freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for total phenols by forming a slurry of soil in water, distillation of the slurry, and finally measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 9 with QC results in Table 10.

Submitted by: Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

Table 1. 8010 Results

| Sample ID#: | 904194 | 904195 | 904191 | 904192 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.016* | 0.010* | 0.020* | 0.004* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | 0.0001 | ND | ND | ND |
| Chloroform | 0.002 | 0.0006 | 0.002 | 0.0008 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.001 | 0.008 | 0.0002 | 0.0003 |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | 0.008 | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | 0.0004 | 0.002 | ND | ND |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| | | | | |
| Analysis Date: | 11/12/85 | 11/12/85 | 11/12/85 | 11/12/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904193 | 904196 | 904215 | 904216 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | 0.0008 | 0.0001 | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.012* | 0.006* | 0.007* | 0.020* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | 0.0001 |
| Chloroform | 0.001 | 0.0009 | 0.0009 | 0.001 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.0002 | 0.0003 | 0.0005 | 0.0004 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | 0.002 | ND | ND |
| Chlorobenzene | ND | ND | 0.0003 | ND |
| Dichlorobenzenes | ND | 0.002 | ND | ND |
| Analysis Date: | 11/12/85 | 11/12/85 | 11/12/85 | 11/13/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904217 | 904218 | 904219 | 904220 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | 0.0001 | ND | 0.0001 | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.008* | 0.009* | 0.025* | 0.015* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0007 | 0.0009 | 0.002 | 0.001 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | 0.0001 | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.0001 | 0.0001 | 0.0001 | 0.0002 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 11/13/85 | 11/13/85 | 11/13/85 | 11/13/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904228 | 904225 | 904226 | 904227 |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.017* | 0.015* | 0.007* | 0.033* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | 0.0001 | ND | ND | 0.0002 |
| Chloroform | 0.002 | 0.001 | 0.0007 | 0.006 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | 0.0001 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.010 | 0.0001 | 0.0001 | 0.003 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | 0.0004 | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | 0.002 | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | 0.0005 |
| Analysis Date: | 11/13/85 | 11/13/85 | 11/13/85 | 11/13/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Concluded)

| Sample ID#: | 904230 | Detection Limit |
|---|---|---|
| Compound | Concentration µg/g | |
| Chloromethane | ND | 0.00008 |
| Bromomethane | ND | 0.001 |
| Dichlorodifluoromethane | ND | 0.002 |
| Vinyl chloride | ND | 0.0002 |
| Chloroethane | ND | 0.0005 |
| Methylene chloride | 0.029* | 0.0002 |
| Trichlorofluoromethane | ND | 0.001 |
| 1,1-DCE | ND | 0.0001 |
| 1,1-DCA | ND | 0.00007 |
| trans-1,2-DCE | 0.0001 | 0.0001 |
| Chloroform | 0.002 | 0.00005 |
| 1,2-DCA | ND | 0.00003 |
| 1,1,1-TCA | ND | 0.00003 |
| Carbon tetrachloride | ND | 0.0001 |
| Bromodichloromethane | ND | 0.0001 |
| 1,2-Dichloropropane | ND | 0.00004 |
| trans-1,3-Dichloropropane | ND | 0.0003 |
| TCE | ND | 0.0001 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | 0.0002 |
| Chloroethylvinyl ether | ND | 0.0001 |
| Bromoform | ND | 0.0002 |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | 0.0003 |
| Chlorobenzene | ND | 0.0002 |
| Dichlorobenzenes | ND | 0.0003 |

Analysis Date: 11/13/85

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 8010 QC

| Sample ID#: | Method Blank | Duplicate 904227 | Duplicate 904228 | 904226 % Recovery (Spike Level 0.005 μg/g) |
|---|---|---|---|---|
| Compound | Concentration μg/g | | | |
| Chloromethane | ND | ND | ND | NS |
| Bromomethane | ND | ND | ND | 40 |
| Dichlorodifluoromethane | ND | ND | ND | NS |
| Vinyl chloride | ND | ND | ND | 104 |
| Chloroethane | ND | ND | ND | 86 |
| Methylene chloride | 0.0004 | 0.011* | 0.008* | 106 |
| Trichlorofluoromethane | ND | ND | ND | 94 |
| 1,1-DCE | ND | ND | ND | 96 |
| 1,1-DCA | ND | ND | ND | 94 |
| trans-1,2-DCE | ND | 0.0001 | ND | 94 |
| Chloroform | 0.0003 | 0.003 | ND | 78 |
| 1,2-DCA | ND | ND | ND | 76 |
| 1,1,1-TCA | 0.00004 | 0.0001 | 0.0001 | 90 |
| Carbon tetrachloride | ND | ND | ND | 94 |
| Bromodichloromethane | ND | ND | ND | NS |
| 1,2-Dichloropropane | ND | ND | ND | 90 |
| trans-1,3-Dichloropropane | ND | ND | ND | 92 |
| TCE | ND | 0.002 | 0.009 | 90 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | 0.006 | 91 |
| Chloroethylvinyl ether | ND | ND | ND | NS |
| Bromoform | ND | ND | ND | 80 |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | 0.002 | 99 |
| Chlorobenzene | ND | 0.0003 | ND | 92 |
| Dichlorobenzenes | ND | ND | ND | 93 |
| Analysis Date: | 11/12/85 | 11/13/85 | 11/14/85 | 11/13/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level
NS - Not spiked

Table 3. 8020 Results

| Sample ID#: | 904194 | 904195 | 904191 | 904192 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Xylenes | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 10/30/85 | 10/30/85 | 10/30/85 | 10/30/85 |
| % Surrogate Recovery | 53 | 79 | 65 | 48 |

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904193 | 904196 | 904215 | 904216 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Xylenes | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 10/30/85 | 10/30/85 | 10/30/85 | 10/30/85 |
| % Surrogate Recovery | 64 | 74 | 64 | 86 |

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904217 | 904218 | 904219 | 904220 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Xylenes | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 10/30/85 | 10/30/85 | 10/31/85 | 10/31/85 |
| % Surrogate Recovery | 71 | 92 | 90 | 92 |

Table 3. 8020 Results
(Concluded)

| Sample ID#: | 904228 | 904225 | 904226 | 904227 | 904230 | Detection Limit |
|---|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | | |
| Benzene | ND | ND | ND | 0.011 | ND | 0.0002 |
| Toluene | ND | ND | ND | 0.034 | ND | 0.0002 |
| Ethylbenzene | ND | ND | ND | 0.030 | ND | 0.0002 |
| Chlorobenzene[1] | ND | ND | ND | 0.032 | ND | 0.0002 |
| Xylenes[2] | ND | ND | ND | 0.030 | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | ND | 0.032 | ND | 0.0004 |
| Analysis Date: | 10/31/85 | 10/31/85 | 10/31/85 | 11/1/85 | 11/1/85 | |
| % Surrogate Recovery | 102 | 61 | 80 | 94 | 82 | |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 4. 8020 QC

| Sample ID#: | Method Blank | Duplicate 904227 | Duplicate 904230 | 904194 % Recovery (Spike Level 0.005 µg/g) |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | 0.013 | ND | 78 |
| Toluene | ND | 0.051 | ND | 79 |
| Ethylbenzene | ND | 0.056 | ND | 85 |
| Chlorobenzene[1] | ND | 0.063 | ND | 81 |
| Xylenes[2] | ND | 0.060 | ND | 80 |
| Dichlorobenzenes | ND | 0.070 | ND | 67 |
| Analysis Date: | 10/30/85 | 10/30/85 | 11/1/85 | 11/1/85 |
| % Surrogate Recovery | NA* | 78 | 103 | 77 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

* Not added

Table 5. 509A Results

| Sample ID#: | 904194 | 904195 | 904191 | 904192 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Aldrin | ND | ND | ND | ND |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | ND | ND | ND | ND |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |

ND - Not detected

Table 5. 509A Results
(Continued)

| Sample ID#: | 904193 | 904196 | 904215 | 904216 |
|---|---|---|---|---|
| Compound | *Concentration µg/g* | | | |
| Aldrin | ND | ND | ND | ND |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | ND | ND | ND | ND |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |

ND - Not detected

Table 5. 509A Results
(Continued)

| Sample ID#: | 904217 | 904218 | 904219 | 904220 |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Aldrin | ND | ND | ND | ND |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | ND | ND | ND | ND |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |

ND - Not detected

Table 5. 509A Results
(Continued)

| Sample ID#: | 904228 | 904221 | 904222 | 904223 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Aldrin | ND | ND | ND | ND |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | ND | ND | ND | ND |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |

ND - Not detected

Table 5. 509A Results
(Concluded)

| Sample ID#: | 904224 | 904229 | Detection Limit |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Aldrin | ND | ND | 0.008 |
| Dieldrin | ND | ND | 0.02 |
| Chlordane | ND | ND | 0.08 |
| 4,4'-DDT | ND | ND | 0.02 |
| 4,4'-DDE | ND | ND | 0.02 |
| 4,4'-DDD | ND | ND | 0.02 |
| alpha-Endosulfan | ND | ND | 0.08 |
| beta-endosulfan | ND | ND | 0.02 |
| Endosulfan sulfate | ND | ND | 0.02 |
| Endrin | ND | ND | 0.02 |
| Endrin aldehyde | ND | ND | 0.02 |
| Heptachlor | ND | ND | 0.008 |
| Heptachlor epoxide | ND | ND | 0.008 |
| alpha-BHC | ND | ND | 0.008 |
| beta-BHC | ND | ND | 0.008 |
| delta-BHC | ND | ND | 0.008 |
| gamma-BHC (Lindane) | ND | ND | 0.008 |
| Toxaphene | ND | ND | 0.2 |
| Strobane | ND | ND | 0.2 |
| Dichloran | ND | ND | 0.008 |
| PCNB | ND | ND | 0.008 |
| Captan | ND | ND | 0.02 |
| Mirex | ND | ND | 0.02 |
| Methoxychlor | ND | ND | 0.08 |

ND - Not detected

Table 6. 509A QC

| Sample ID#: | Method Blank | Duplicate 904215 | Duplicate 904224 | 904215 % Recovery | Spike Level |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Aldrin | ND | ND | ND | 118 | 0.027 |
| Dieldrin | ND | ND | ND | 91 | 0.067 |
| Chlordane | ND | ND | ND | 94 | ND |
| 4,4'-DDT | ND | ND | ND | NS | ND |
| 4,4'-DDE | ND | ND | ND | NS | ND |
| 4,4'-DDD | ND | ND | ND | NS | ND |
| alpha-Endosulfan | ND | ND | ND | NS | ND |
| beta-endosulfan | ND | ND | ND | NS | ND |
| Endosulfan sulfate | ND | ND | ND | NS | ND |
| Endrin | ND | ND | ND | 93 | 0.067 |
| Endrin aldehyde | ND | ND | ND | NS | ND |
| Heptachlor | ND | ND | ND | 102 | 0.027 |
| Heptachlor epoxide | ND | ND | ND | NS | ND |
| alpha-BHC | ND | ND | ND | NS | ND |
| beta-BHC | ND | ND | ND | NS | ND |
| delta-BHC | ND | ND | ND | NS | ND |
| gamma-BHC (Lindane) | ND | ND | ND | 96 | 0.027 |
| Toxaphene | ND | ND | ND | NS | ND |
| Strobane | ND | ND | ND | NS | ND |
| Dichloran | ND | ND | ND | NS | ND |
| PCNB | ND | ND | ND | NS | ND |
| Captan | ND | ND | ND | NS | ND |
| Mirex | ND | ND | ND | NS | ND |
| Methoxychlor | ND | ND | ND | NS | ND |

ND - Not detected

NS - Not spiked

Table 7. 509B Results

| Sample ID#: | 904194 | 904195 | 904191 | 904192 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| 2,4-D | ND | <0.1[a] | ND | <0.1[a] |
| 2,4,5-T | ND | <0.1 | ND | <0.1 |
| Silvex | ND | <0.1 | ND | <0.1 |

ND - Not detected

a - Interferences raised detection limit

Table 7. 509B Results
(Continued)

| Sample ID#: | 904193 | 904196 | 904215 | 904216 |
|---|---|---|---|---|
| Compound | Concentration μg/g | | | |
| 2,4-D | ND | ND | <0.1[a] | ND |
| 2,4,5-T | ND | ND | <0.1 | ND |
| Silvex | ND | ND | <0.1 | ND |

ND - Not detected

a - Interferences raised detection limit

Table 7. 509B Results
(Continued)

| Sample ID#: | 904217 | 904218 | 904219 | 904220 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| 2,4-D | ND | ND | ND | ND |
| 2,4,5-T | ND | ND | ND | ND |
| Silvex | ND | ND | ND | ND |

ND - Not detected

Table 7. 509B Results
(Continued)

| Sample ID#: | 904228 | 904221 | 904222 | 904223 |
|---|---|---|---|---|
| Compound | Concentration μg/g | | | |
| 2,4-D | ND | ND | ND | ND |
| 2,4,5-T | ND | ND | ND | ND |
| Silvex | ND | ND | ND | ND |

ND - Not detected

Table 7. 509B Results
(Concluded)

| Sample ID#: | 904224 | 904229 | Detection Limit |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| 2,4-D | ND | ND | 0.06 |
| 2,4,5-T | ND | ND | 0.06 |
| Silvex | ND | ND | 0.06 |

ND - Not detected

Table 8. 509B QC

| Sample ID#: | Method Blank | Duplicate 904194 | 904194 % Recovery |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| 2,4-D | ND | ND | 89 |
| 2,4,5-T | ND | ND | 89 |
| Silvex | ND | ND | 89 |

ND - Not detected

Table 9. General Chemistry Results

| Sample ID | Oil and Grease, μg/g | Phenols, total, μg/g |
|---|---|---|
| 904194 | <100 | <1 |
| 904195 | <100 | <1 |
| 904191 | <100 | <1 |
| 904192 | <100 | <1 |
| 904193 | <100 | <1 |
| 904196 | <100 | <1 |
| 904215 | <100 | <1 |
| 904216 | <100 | <1 |
| 904217 | <100 | <1 |
| 904218 | <100 | <1 |
| 904219 | <100 | <1 |
| 904220 | <100 | <1 |
| 904228 | <100 | <1 |
| 904225 | <100 | <1 |
| 904226 | <100 | <1 |
| 904227 | 7,000 | 1.6 |
| 904230 | <100 | <1 |

Table 10. General Chemistry QC

| Sample ID | Oil and Grease, µg/g |
|---|---|
| Method Blank | <100 |
| 904227 duplicate | 6,500 |
| 904230 duplicate | <100 |
| 904220 spiked at 290 µg/g | 106% Recovery |

| Sample ID | Phenols, total, µg/g |
|---|---|
| Method Blank | <1 |
| 904216 duplicate | <1 |
| 904218 duplicate | <1 |
| 904226 spiked at 2.0 µg/g | 106% Recovery |

RECEIVED
DEC 16 1985
AeroVironment Inc.

# CHEMICAL ANALYSIS OF SOIL SAMPLES

DECEMBER 10, 1985

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

**ACUREX Corporation**

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

December 10, 1985
Acurex ID#: 8510-054


Attention: Chris Lovedahl

Subject: Four Soils for Analysis; Received 10/29/85

Selected samples were analyzed following EPA method 8010 using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1. QC results for Method 8010 are presented in Table 2.

Selected samples were analyzed following EPA Method 8020 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 8020 are presented in Table 4.

555 Clyde Avenue PO Box 7555 Mountain View, CA 94039 (415) 964-3200 Telex 34-6391 TWX 910-3796593

Selected samples were analyzed for oil and grease by sonicating the soil in freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 5 with QC results in Table 6.

Selected samples were analyzed for total phenols by forming a slurry of soil in water, distillation of the slurry, and finally measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 5 with QC results in Table 6.

Submitted by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila
Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

Table 1. 8010 Results

| Sample ID#: | 904246 | 904248 | 904249 | 904250 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Chloromethane | ND | ND | ND | ND | 0.00008 |
| Bromomethane | ND | ND | ND | ND | 0.001 |
| Dichlorodifluoromethane | ND | ND | ND | ND | 0.002 |
| Vinyl chloride | ND | ND | ND | ND | 0.0002 |
| Chloroethane | ND | ND | ND | ND | 0.0005 |
| Methylene chloride | 0.016* | 0.031* | 0.003* | 0.014* | 0.0002 |
| Trichlorofluoromethane | ND | ND | ND | ND | 0.001 |
| 1,1-DCE | ND | ND | ND | ND | 0.0001 |
| 1,1-DCA | ND | ND | ND | ND | 0.00007 |
| trans-1,2-DCE | ND | 0.0004 | ND | ND | 0.0001 |
| Chloroform | 0.001 | 0.002 | 0.0001 | ND | 0.00005 |
| 1,2-DCA | ND | ND | ND | ND | 0.00003 |
| 1,1,1-TCA | ND | 0.0001 | 0.0001 | ND | 0.00003 |
| Carbon tetrachloride | ND | ND | ND | ND | 0.0001 |
| Bromodichloromethane | ND | ND | ND | ND | 0.0001 |
| 1,2-Dichloropropane | ND | ND | ND | ND | 0.00004 |
| trans-1,3-Dichloropropane | ND | ND | ND | ND | 0.0003 |
| TCE | ND | 0.005 | ND | ND | 0.0001 |
| Dibromochloromethane[a] | | | | | |
| 1,1,2-Trichloroethane[a] | ND | 0.0001 | ND | ND | 0.0002 |
| cis-1,3-Dichloropropane[a] | | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND | 0.0001 |
| Bromoform | ND | ND | ND | ND | 0.0002 |
| Tetrachloroethane[b] | ND | 0.002 | ND | ND | 0.0003 |
| Tetrachloroethene[b] | | | | | |
| Chlorobenzene | ND | ND | 0.0003 | 0.0009 | 0.0002 |
| Dichlorobenzenes | ND | ND | ND | ND | 0.0003 |
| Analysis Date: | 11/13/85 | 11/14/85 | 11/14/85 | 11/14/85 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 8010 QC

| Sample ID#: | Method Blank |
|---|---|
| Compound | Concentration μg/g |
| Chloromethane | ND |
| Bromomethane | ND |
| Dichlorodifluoromethane | ND |
| Vinyl chloride | ND |
| Chloroethane | ND |
| Methylene chloride | 0.0004 |
| Trichlorofluoromethane | ND |
| 1,1-DCE | ND |
| 1,1-DCA | ND |
| trans-1,2-DCE | ND |
| Chloroform | 0.0003 |
| 1,2-DCA | ND |
| 1,1,1-TCA | 0.00004 |
| Carbon tetrachloride | ND |
| Bromodichloromethane | ND |
| 1,2-Dichloropropane | ND |
| trans-1,3-Dichloropropane | ND |
| TCE | ND |
| Dibromochloromethane[a] | |
| 1,1,2-Trichloroethane[a] | ND |
| cis-1,3-Dichloropropane[a] | |
| Chloroethylvinyl ether | ND |
| Bromoform | ND |
| Tetrachloroethane[b] | ND |
| Tetrachloroethene[b] | |
| Chlorobenzene | ND |
| Dichlorobenzenes | ND |
| Analysis Date: | 11/13/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 3. 8020 Results

| Sample ID#: | 904246 | 904248 | 904249 | 904250 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Benzene | 0.0015 | 0.0007 | 1.6 | 0.0045 | 0.0002 |
| Toluene | 0.0005 | 0.0014 | 1.3 | 0.0015 | 0.0002 |
| Ethylbenzene | 0.0003 | 0.0006 | 2.4 | 0.0020 | 0.0002 |
| Chlorobenzene[1] | 0.0006 | 0.0010 | 3.4 | 0.0040 | 0.0002 |
| Xylenes[2] | 0.0002 | 0.0003 | 1.6 | 0.0010 | 0.0002 |
| Dichlorobenzenes | 0.0032 | 0.0055 | <0.02 | 0.013 | 0.0004 |
| Analysis Date: | 12/2/85 | 12/2/85 | 12/2/85 | 12/2/85 | |
| % Surrogate Recovery | 62 | 52 | 66 | 68 | |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 4. 8020 QC

| Sample ID#: | Method Blank |
|---|---|
| Compound | Concentration µg/g |
| Benzene | ND |
| Toluene | 0.0005 |
| Ethylbenzene | 0.0005 |
| Chlorobenzene[1] | 0.0003 |
| Xylenes[2] | ND |
| Dichlorobenzenes | 0.0034 |
| Analysis Date: | 12/2/85 |
| % Surrogate Recovery | NA* |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene
* Not added

Table 5. General Chemistry Results

| Sample ID | Oil and Grease, µg/g | Phenols, total, µg/g |
|---|---|---|
| 904246 | <100 | <1 |
| 904248 | 3,900 | 1 |
| 904249 | 1,500 | <1 |
| 904250 | <100 | <1 |

Table 6. General Chemistry QC

| Sample ID | Oil and Grease, μg/g |
|---|---|
| Method Blank | <100 |
| 904246 duplicate | <100 |
| 904250 spiked at 290 μg/g | 106% Recovery |
| | **Phenols, total, μg/g** |
| Method Blank | <1 |

1 07/6K

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# CHEMICAL ANALYSIS OF SOIL SAMPLES

DECEMBER 27, 1985

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

**ACUREX Corporation**

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

December 27, 1985
Acurex ID#: 8511-003
Page 1 of 26

Attention: Chris Lovedahl

Subject: Thirty-one Soils for Analysis; Received 11/4/85

Selected samples were analyzed following EPA method 8010 using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1. QC results for Method 8010 are presented in Table 2.

Selected samples were analyzed following EPA Method 8020 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

The method 8020 analyses were delayed due to the PID detector breaking and the inability of HNU to provide a replacement part. When HNU finally sent a replacement, it turned out to be defective. At that point, Acurex obtained a Varian PID which was employed in the analyses. Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 8020 are presented in Table 4.

Selected samples were analyzed for pesticides following Method 509A and herbicides following Method 509B (Standard Methods for the Examination of Water and Wastewater, 16th edition). A 3% OV-1 column was employed as the primary column for pesticides. A 30 meter DB1 fused silica column was used as the primary column for the herbicides. Samples for pesticide analysis were sonicated in 15% methylene chloride/hexane, concentrated, and then injected into a gas chromatograph operated isothermally. Detection of the eluting compounds were performed with an electron capture detector. Samples for herbicide analysis were extracted with diethyl ether and the extract hydrolyzed. The herbicide acids were methylated and then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of the pesticides and herbicides. Results of the 509A analyses are presented in Table 5 with QC results in Table 6. Results of the 509B analyses are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for oil and grease by sonicating the soil in freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for total phenols by forming a slurry of soil in water, distillation of the slurry, and finally measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for petroleum hydrocarbons by sonicating the soil in freon (EPA method 3550), passing the extract across silica gel, and then analyzing the solvent by infrared spectroscopy using EPA method 413.2. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for lead by rigorous digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 9 with QC results in Table 10.

Submitted by: Greg Nicoll, Manager, Inorganic Chemistry — Viorica Lopez-Avila, Ph.D., Technical Director

GN/VLA/kek

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. 8010 Results

| Sample ID#: | 904197 | 904199 | 904200 | 904201 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.005* | 0.011* | 0.007* | 0.003* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | 0.0001 | ND | ND |
| Chloroform | 0.0008 | 0.009 | 0.0002 | 0.0001 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | 0.0001 | ND | 0.00004 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | 0.0004 | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | 0.004 | 0.0002 | 0.0003 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | 0.0001 | 0.0001 | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | 0.0003 | 0.001 | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | 0.0006 | ND | ND | ND |
| Surrogate Recovery[c] | 58 | NS | NS | NS |
| Analysis Date: | 12/2/85 | 11/14/85 | 11/14/85 | 11/14/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level
NS - Not spiked

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904202 | 904203 | 904204 | 904206 |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Chloromethane | ND | 0.0008 | 0.0001 | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.003* | 0.0009* | 0.0009* | 0.0003* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0001 | 0.0008 | 0.0005 | 0.001 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | 0.0002 | 0.0002 | 0.0001 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | 0.0002 | ND | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | 0.0003 | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery[c] | NS | NS | NS | NS |
| Analysis Date: | 11/14/85 | 11/15/85 | 11/15/85 | 11/15/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level
NS - Not spiked

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904207 | 904208 | 904210 | 904211 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.003* | 0.0005* | 0.010* | 0.0006* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | 0.0002 |
| Chloroform | 0.001 | 0.0006 | 0.003 | 0.0007 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | 0.0001 | 0.0001 | 0.0005 | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.0003 | ND | 0.002 | 0.0001 |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | 0.011 | 0.004 |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | 0.0007 | ND | 0.010 | 0.004 |
| Surrogate Recovery[c] | NS | NS | 79 | NS |
| Analysis Date: | 11/15/85 | 11/15/85 | 12/3/85 | 11/15/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level
NS - Not spiked

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904212 | 904213 | 904214 | 904231 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.0009* | 0.006* | 0.0004* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | 0.0001 | 0.0002 | ND |
| Chloroform | 0.0008 | 0.0005 | 0.0005 | 0.0006 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | 0.00003 | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | 0.0009 | 0.0002 | 0.001 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | 0.0004 | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | 0.0009 | ND |
| Surrogate Recovery[c] | NS | 74 | NS | NS |
| Analysis Date: | 11/15/85 | 12/2/85 | 11/15/85 | 11/14/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level
NS - Not spiked

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904232 | 904234 | 904235[d] | 904236 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.0003* | ND | 3.7 | 0.005* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | 0.003 | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | 1.1 | 0.014 |
| Chloroform | 0.0004 | 0.0004 | 0.67 | 0.001 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | 0.007 | 0.0001 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | 0.005 | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.0001 | ND | 2.5 | 0.025 |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | 0.026 | 0.002 |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | 0.10 | 0.033 |
| Surrogate Recovery[c] | NS | NS | 115 | 67 |
| Analysis Date: | 11/15/85 | 11/15/85 | 11/18/85 | 11/18/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
d - Detection limits are 100 times method detection limit for this sample
* - Below normal laboratory background level
NS - Not spiked

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904237 | 904238 | 904239 | 904240 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.004* | 0.002* | 0.002* | 0.003* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | 0.003 | 0.0001 | ND | 0.002 |
| Chloroform | 0.001 | 0.0006 | 0.0004 | 0.0007 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | 0.0001 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.021 | 0.0009 | 0.0002 | 0.0002 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | 0.0002 | 0.0001 | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | 0.0008 | ND | ND | ND |
| Surrogate Recovery[c] | 102 | 86 | 90 | 101 |
| Analysis Date: | 11/18/85 | 11/18/85 | 11/18/85 | 11/18/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level
NS - Not spiked

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904241 | 904242 | 904251 | 904252 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.004* | 0.004* | 0.003* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | 0.001 | 0.077 | 0.0008 | 0.0003 |
| Chloroform | 0.0005 | 0.002 | 0.0005 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | 0.00003 | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.0002 | 0.14 | 0.001 | 0.001 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | 0.0003 |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | 0.002 | 0.002 | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | 0.003 | 0.002 | ND |
| Surrogate Recovery[c] | 83 | 109 | 82 | 87 |
| Analysis Date: | 11/18/85 | 11/18/85 | 11/18/85 | 11/18/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level
NS - Not spiked

Table 1. 8010 Results
(Concluded)

| Sample ID#: | 904254 | Detection Limit |
|---|---|---|
| Compound | Concentration µg/g | |
| Chloromethane | ND | 0.00008 |
| Bromomethane | ND | 0.001 |
| Dichlorodifluoromethane | ND | 0.002 |
| Vinyl chloride | ND | 0.0002 |
| Chloroethane | ND | 0.0005 |
| Methylene chloride | 0.003* | 0.0002 |
| Trichlorofluoromethane | ND | 0.001 |
| 1,1-DCE | ND | 0.0001 |
| 1,1-DCA | ND | 0.00007 |
| trans-1,2-DCE | ND | 0.0001 |
| Chloroform | ND | 0.00005 |
| 1,2-DCA | ND | 0.00003 |
| 1,1,1-TCA | ND | 0.00003 |
| Carbon tetrachloride | ND | 0.0001 |
| Bromodichloromethane | ND | 0.0001 |
| 1,2-Dichloropropane | ND | 0.00004 |
| trans-1,3-Dichloropropane | ND | 0.0003 |
| TCE | 0.0005 | 0.0001 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | 0.0002 |
| Chloroethylvinyl ether | ND | 0.0001 |
| Bromoform | ND | 0.0002 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | 0.0003 |
| Chlorobenzene | ND | 0.0002 |
| Dichlorobenzenes | ND | 0.0003 |
| Surrogate Recovery[c] | 75 | |
| Analysis Date: | 11/18/85 | |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level
NS - Not spiked

Table 2. 8010 QC

| Sample ID#: | Method Blank | Method Blank | Method Blank | Method Blank |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | ND | 0.0009 | 0.002 | 0.001 |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | 0.0002 | ND | ND |
| Chloroform | ND | ND | 0.0001 | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | 0.00004 | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | 0.0007 | ND | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | 0.0007 |
| Surrogate Recovery[c] | NS | NS | NS | NS |
| Analysis Date: | 11/15/85 | 11/18/85 | 12/2/85 | 12/3/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level
NS - Not spiked

Table 2. 8010 QC

| Sample ID#: | Duplicate 904213 | Duplicate 904236 | Duplicate 904237 | 904234 % Recovery (Spike Level 0.005 µg/g) |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | 72 |
| Bromomethane | ND | ND | ND | 75 |
| Dichlorodifluoromethane | ND | ND | ND | NS |
| Vinyl chloride | ND | ND | ND | 79 |
| Chloroethane | ND | ND | ND | 70 |
| Methylene chloride | 0.005* | 0.011* | 0.011* | 91 |
| Trichlorofluoromethane | ND | ND | ND | 78 |
| 1,1-DCE | ND | ND | ND | 79 |
| 1,1-DCA | ND | ND | ND | 78 |
| trans-1,2-DCE | ND | 0.0001 | 0.001 | 79 |
| Chloroform | 0.0007 | 0.004 | 0.002 | 81 |
| 1,2-DCA | ND | ND | ND | 75 |
| 1,1,1-TCA | ND | 0.0001 | ND | 79 |
| Carbon tetrachloride | ND | ND | ND | 82 |
| Bromodichloromethane | ND | ND | ND | 74 |
| 1,2-Dichloropropane | ND | ND | ND | 78 |
| trans-1,3-Dichloropropane | ND | ND | ND | 75 |
| TCE | 0.0007 | 0.002 | 0.015 | 82 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | 0.0002 | 0.0001 | 72 |
| Chloroethylvinyl ether | ND | ND | ND | NS |
| Bromoform | ND | ND | ND | 49 |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | 0.0006 | 0.0003 | 73 |
| Chlorobenzene | ND | ND | ND | 72 |
| Dichlorobenzenes | 0.0007 | 0.013 | 0.0007 | 78 |
| Surrogate Recovery[c] | 93 | 68 | 104 | 91 |
| Analysis Date: | 12/2/85 | 12/3/85 | 12/3/85 | 12/3/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level
NS - Not spiked

Table 3. 8020 Results

| Sample ID#: | 904197 | 904200 | 904201 | 904202 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | ND |
| Toluene | 0.029 | ND | 0.0010 | 0.0004 |
| Ethylbenzene | 0.0010 | 0.0006 | 0.0009 | 0.0007 |
| Chlorobenzene | ND | ND | ND | ND |
| Xylenes | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 12/10/85 | 12/10/85 | 12/10/85 | 12/10/85 |
| % Surrogate Recovery | 103 | 108 | 128 | 101 |

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904203 | 904204 | 904206 | 904207 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | ND |
| Toluene | 0.0003 | ND | 0.0005 | ND |
| Ethylbenzene | 0.0006 | 0.0006 | 0.0007 | 0.0008 |
| Chlorobenzene | ND | ND | ND | ND |
| Xylenes | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 12/11/85 | 12/11/85 | 12/10/85 | 12/11/85 |
| % Surrogate Recovery | 86 | 72 | 110 | 86 |

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904208 | 904212 | 904214 | 904231 |
|---|---|---|---|---|
| Compound | Concentration μg/g | | | |
| Benzene | ND | ND | 0.0002 | ND |
| Toluene | ND | 0.0002 | 0.0002 | 0.0002 |
| Ethylbenzene | 0.0005 | 0.0006 | 0.0006 | 0.0007 |
| Chlorobenzene[1] | ND | ND | 0.0004 | ND |
| Xylenes[2] | 0.0003 | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 12/11/85 | 12/11/85 | 12/11/85 | 12/10/85 |
| % Surrogate Recovery | 75 | 76 | 75 | 83 |

[1]Chlorobenzene and meta-xylene

[2]Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | .,4232 | 904234 | 904237 | 904238 |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Benzene | ND | 0.0002 | 0.0003 | ND |
| Toluene | ND | 0.0004 | 0.0018 | 0.0004 |
| Ethylbenzene | 0.0006 | 0.0010 | 0.0006 | 0.0006 |
| Chlorobenzene[1] | ND | 0.0003 | ND | ND |
| Xylenes[2] | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 12/10/85 | 12/13/85 | 12/10/85 | 12/11/85 |
| % Surrogate Recovery | 98 | 90 | 118 | 80 |

[1]Chlorobenzene and meta-xylene

[2]Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904254 | 904252 | 904199[3] | 904210[4] |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | ND |
| Toluene | ND | 0.0021 | ND | ND |
| Ethylbenzene | 0.0005 | 0.0009 | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | 0.030 | 1.2 |
| Dichlorobenzenes | ND | ND | 0.018 | ND |
| Analysis Date: | 12/10/85 | 12/12/85 | 12/12/85 | 12/12/85 |
| % Surrogate Recovery | 96 | 103 | 229[5] | 294[5] |

[1]Chlorobenzene and meta-xylene
[2]Ortho-xylene and para-xylene
[3]Detection limit increased by a factor of 5 due to sample matrix interferences
[4]Detection limit increased by a factor of 100 due to sample matrix interferences
[5]High surrogate recovery due to sample matrix interferences

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904211[3] | 904213[3] | 904239[3] | 904240[3] |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | ND |
| Toluene | 0.14 | 0.10 | 0.21 | 0.40 |
| Ethylbenzene | 0.38 | 0.49 | 0.25 | 0.46 |
| Chlorobenzene[1] | ND | ND | ND | ND |
| Xylenes[2] | 0.20 | ND | ND | 0.61 |
| Dichlorobenzenes | ND | 1.3[4] | ND | ND |
| Analysis Date: | 12/13/85 | 12/12/85 | 12/14/85 | 12/14/85 |
| % Surrogate Recovery | 113 | 156 | 103 | 126 |

[1]Chlorobenzene and meta-xylene
[2]Ortho-xylene and para-xylene
[3]Detection limit increased by 250 due to sample matrix interferences
[4]Not resolved from matrix interferences

Table 3. 8020 Results
(Concluded)

| Sample ID#: | 904241[3] | 904235[4] | 904251[4] | 904242[5] | 904236[5] | Detection Limit |
|---|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | | |
| Benzene | ND | ND | ND | ND | <1[8] | 0.0002 |
| Toluene | 0.37 | 1.2 | 0.17 | ND | 1.8[8] | 0.0002 |
| Ethylbenzene | 0.26 | 4.1 | 0.57 | <1[7] | ND | 0.0002 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND | 0.0002 |
| Xylenes[2] | 0.24 | 6.7 | 0.32 | <1[7] | 14[8] | 0.0002 |
| Dichlorobenzenes | ND | ND | ND | <1[7] | <1[8] | 0.0004 |
| Analysis Date: | 12/14/85 | 12/13/85 | 12/14/85 | 12/14/85 | 12/14/86 | |
| % Surrogate Recovery | 98 | 268[6] | 107 | 130 | 311[6] | |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

3 Detection limit increased by 250 due to sample matrix interferences

4 Detection limit increased by 500 due to sample matrix interferences

5 Detection limit increased by 1000 due to sample matrix interferences

6 High surrogate recovery due to high matrix interferences

7 GC analysis gave levels of 16, 22, and 30 µg/g for ethylbenzene, xylenes, and dichlorobenzenes, but was not confirmed by GC/MS (Method 8240).

8 GC analysis gave a benzene level of 12 and a dichlorobenzene level of 21, but not confirmed by GC/MS (Method 8240). Toluene and xylenes were confirmed.

Table 4. 8020 QC

| Sample ID#: | Method Blank | Duplicate 904231 | Duplicate 904232 | Duplicate 904237 | 904254 % Recovery (Spike Level 0.005 µg/g) |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Benzene | ND | ND | ND | 0.0003 | 95 |
| Toluene | 0.0003 | 0.0003 | 0.0004 | 0.0013 | 95 |
| Ethylbenzene | 0.001 | 0.0011 | 0.0010 | 0.0010 | 93 |
| Chlorobenzene[1] | ND | ND | 0.063 | ND | 81 |
| Xylenes[2] | ND | ND | 0.060 | ND | 68 |
| Dichlorobenzenes | ND | ND | 0.070 | ND | 52 |
| Analysis Date: | 12/11/85 | 12/16/85 | 12/16/85 | 12/16/85 | 12/16/85 |
| % Surrogate Recovery | NS* | 141 | 154 | 105 | 77 |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene
* Not spiked

Table 5. 509A Results

| Sample ID#: | 904243 | 904244 | Detection Limit |
|---|---|---|---|
| Compound | Concentration ug/g | | |
| Aldrin | ND | ND | 0.008 |
| Dieldrin | ND | ND | 0.02 |
| Chlordane | 0.90 | 0.10 | 0.08 |
| 4,4'-DDT | ND | ND | 0.02 |
| 4,4'-DDE | ND | ND | 0.02 |
| 4,4'-DDD | ND | ND | 0.02 |
| alpha-Endosulfan | ND | ND | 0.08 |
| beta-endosulfan | ND | ND | 0.02 |
| Endosulfan sulfate | ND | ND | 0.02 |
| Endrin | ND | ND | 0.02 |
| Endrin aldehyde | ND | ND | 0.02 |
| Heptachlor | ND | ND | 0.008 |
| Heptachlor epoxide | ND | ND | 0.008 |
| alpha-BHC | ND | ND | 0.008 |
| beta-BHC | ND | ND | 0.008 |
| delta-BHC | ND | ND | 0.008 |
| gamma-BHC (Lindane) | ND | ND | 0.008 |
| Toxaphene | ND | ND | 0.2 |
| Strobane | ND | ND | 0.2 |
| Dichloran | ND | ND | 0.008 |
| PCNB | ND | ND | 0.008 |
| Captan | ND | ND | 0.02 |
| Mirex | ND | ND | 0.02 |
| Methoxychlor | ND | ND | 0.08 |

ND - Not detected

Table 6. 509A QC

| Sample ID#: | Method Blank | Duplicate 904243 |
|---|---|---|
| Compound | Concentration µg/g | |
| Aldrin | ND | ND |
| Dieldrin | ND | ND |
| Chlordane | ND | 1.6 |
| 4,4'-DDT | ND | ND |
| 4,4'-DDE | ND | ND |
| 4,4'-DDD | ND | ND |
| alpha-Endosulfan | ND | ND |
| beta-endosulfan | ND | ND |
| Endosulfan sulfate | ND | ND |
| Endrin | ND | ND |
| Endrin aldehyde | ND | ND |
| Heptachlor | ND | ND |
| Heptachlor epoxide | ND | ND |
| alpha-BHC | ND | ND |
| beta-BHC | ND | ND |
| delta-BHC | ND | ND |
| gamma-BHC (Lindane) | ND | ND |
| Toxaphene | ND | ND |
| Strobane | ND | ND |
| Dichloran | ND | ND |
| PCNB | ND | ND |
| Captan | ND | ND |
| Mirex | ND | ND |
| Methoxychlor | ND | ND |

ND - Not detected

Table 7. 509B Results

| Sample ID#: | 904243[1] | 904244[1] | Detection Limit |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| 2,4-D | ND | ND | 0.3 |
| 2,4,5-T | ND | ND | 0.1 |
| Silvex | ND | ND | 0.1 |

ND - Not detected

1 Interferences raised detection limit.

Table 8. 509B QC

| Sample ID#: | Method Blank |
|---|---|
| Compound | Concentration µg/g |
| 2,4-D | ND |
| 2,4,5-T | ND |
| Silvex | ND |

ND - Not detected

Table 9. General Chemistry Results

| Sample ID | Lead, µg/g | Oil and Grease, µg/g | Petroleum Hydrocarbons, µg/g | Phenols, total, µg/g |
|---|---|---|---|---|
| 904197 | 11 | <100 | <100 | <1 |
| 904199 | 13 | 1,400 | 1,400 | <1 |
| 904200 | 10 | <100 | <100 | <1 |
| 904201 | 8 | <100 | <100 | <1 |
| 904202 | 15 | <100 | <100 | <1 |
| 904203 | 9 | <100 | <100 | <1 |
| 904204 | 8 | <100 | <100 | <1 |
| 904206 | 17 | <100 | <100 | <1 |
| 904207 | 9 | <100 | <100 | <1 |
| 904208 | 7 | <100 | <100 | <1 |
| 904210 | 11 | 600 | 600 | <1 |
| 904211 | 14 | 800 | 900 | <1 |
| 904212 | 9 | <100 | <100 | <1 |
| 904213 | 15 | 600 | 700 | 1 |
| 904214 | 9 | <100 | <100 | <1 |
| 904231 | 8 | <100 | <100 | 1 |
| 904232 | 16 | <100 | <100 | <1 |
| 904234 | 8 | <100 | <100 | 1 |
| 904235 | 77 | 1,000 | 1,000 | 1 |
| 904236 | 14 | 4,900 | 4,600 | <1 |
| 904237 | 11 | <100 | <100 | <1 |
| 904238 | 9 | <100 | <100 | <1 |
| 904239 | 9 | <100 | <100 | <1 |
| 904240 | 30 | 900 | 900 | 2 |
| 904241 | 8 | <100 | <100 | <1 |
| 904242 | 12 | 2,800 | 2,400 | <1 |
| 904251 | 13 | 1,100 | 800 | <1 |
| 904252 | 13 | <100 | <100 | <1 |
| 904254 | 15 | <100 | <100 | <1 |

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UNCLASSIFIED F33615-83-D-4000 F/G 24/4 NL

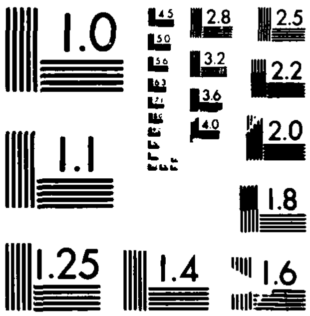


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Table 10. General Chemistry QC

| Sample ID | Lead, μg/g |
|---|---|
| Method Blank | <1 |
| 904210 duplicate | 12 |
| 904231 duplicate | 8 |
| 904252 duplicate | 13 |
| 904214 spiked at 40 μg/g | 100% |
| 904234 spiked at 40 μg/g | 100% |

| | Oil and Grease, μg/g |
|---|---|
| Method Blank | <100 |
| 904239 duplicate | <100 |
| 904241 duplicate | <100 |
| 904254 spiked at 290 μg/g | 103% Recovery |

| | Petroleum Hydrocarbons, μ/g |
|---|---|
| Method Blank | <100 |
| 904239 duplicate | <100 |
| 904241 duplicate | <100 |
| 904254 spiked at 290 μg/g | 118% Recovery |

| | Phenols, total, μg/g |
|---|---|
| Method Blank | <1 |
| Method Blank | <1 |
| 904208 duplicate | <1 |
| 904232 duplicate | <1 |
| 904254 duplicate | <1 |
| 904197 spiked at 2.0 μg/g | 70% Recovery |
| 904199 spiked at 2.0 μg/g | 100% Recovery |

10416K

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AeroVironment Inc.

# CHEMICAL ANALYSIS OF SOIL SAMPLES

DECEMBER 31, 1985

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

**ACUREX Corporation**

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

December 31, 1985
Acurex ID#: 8511-033


Attention: Chris Lovedahl

Subject: Twenty Soils for Analysis; Received 11/14/85

Selected samples were analyzed following EPA method 8010 using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1 including recoveries of dibromethane which was employed as a surrogate. QC results for Method 8010 are presented in Table 2.

Selected samples were analyzed following EPA Method 8020 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

The method 8020 analyses were delayed due to the PID detector breaking and the inability of HNU to provide a replacement part. When HNU finally sent a replacement, it turned out to be defective. At that point, Acurex obtained a Varian PID which was employed in the analyses. Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 8020 are presented in Table 4.

Selected samples were analyzed for pesticides following Method 509A and herbicides following Method 509B (Standard Methods for the Examination of Water and Wastewater, 16th edition). A 3% OV-1 column was employed as the primary

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column for pesticides. A 30 meter DB1 fused silica column was used as the primary column for the herbicides. Samples for pesticide analysis were sonicated in 15% methylene chloride/hexane, concentrated, and then injected into a gas chromatograph operated isothermally. Detection of the eluting compounds were performed with an electron capture detector. Samples for herbicide analysis were extracted with diethyl ether and the extract hydrolyzed. The herbicide acids were methylated and then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of the pesticides and herbicides. Results of the 509A analyses are presented in Table 5 with QC results in Table 6. Results of the 509B analyses are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for oil and grease by sonicating the soil in freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for total phenols by forming a slurry of soil in water, distillation of the slurry, and finally measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 9 with QC results in Table 10.

One soil sample was analyzed for semivolatile organics according to U.S. EPA Method 8270 (Test Methods for Evaluating Solid Waste - SW846, 2nd Ed., 1982). Results are presented in Table 11. The method can be summarized as follows:

> A known amount of sample, approximately 30 g, is serially extracted with methylene chloride. The methylene chloride extracts are combined, dried and concentrated to a volume of 1 mL. The concentrate is injected into GC/MS systems set specifically for the separation and measurement of the priority pollutants. Qualitative identification of the priority pollutants is performed initially using the relative retention times, the relative abundance of three characteristic ions and their ratios. The entire mass spectrum is reviewed before an identification is recorded. Quantitative analysis is performed using an internal standard with a single characteristic ion.

Prior to analysis every sample is spiked with surrogate compounds as part of Acurex's Quality Control Program. These compounds simulate the behavior of compounds of interest and confirm that acceptable recoveries are being achieved on every sample. Other semivolatile QC is reported in Table 12.

Submitted by: [signature] [signature]

Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. 8010 Results

| Sample ID#: | 904253 | 904256 | 904258 | 904260 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.002* | 0.003* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0003 | 0.0004 | 0.0004 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | 0.0001 | ND | ND | 0.0003 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 71 | 105 | 70 | 83 |
| Analysis Date: | 11/18/85 | 11/18/85 | 11/19/85 | 11/19/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904262 | 904264 | 904266 | 904268 |
|---|---|---|---|---|
| Compound | Concentration μg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.002* | 0.003* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0003 | 0.0004 | 0.0004 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | 0.00004 | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 100 | 96 | 79 | 87 |
| Analysis Date: | 11/19/85 | 11/19/85 | 11/19/85 | 11/19/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904279 | 904280 | 904282 | 904283 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Metnylene chloride | 0.001* | 0.003* | 0.003* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0003 | 0.0004 | 0.0004 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | 0.0002 | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 68 | 70 | 83 | 82 |
| Analysis Date: | 11/19/85 | 11/19/85 | 11/19/85 | 11/19/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Concluded)

| Sample ID#: | 904284 | 904286 | Detection Limit |
|---|---|---|---|
| Compound | Concentration μg/g | | |
| Chloromethane | ND | ND | 0.00008 |
| Bromomethane | ND | ND | 0.001 |
| Dichlorodifluoromethane | ND | ND | 0.002 |
| Vinyl chloride | ND | ND | 0.0002 |
| Chloroethane | ND | ND | 0.0005 |
| Methylene chloride | 0.002* | 0.002* | 0.0002 |
| Trichlorofluoromethane | ND | ND | 0.001 |
| 1,1-DCE | ND | ND | 0.0001 |
| 1,1-DCA | ND | ND | 0.00007 |
| trans-1,2-DCE | ND | ND | 0.0001 |
| Chloroform | 0.0003 | 0.0003 | 0.00005 |
| 1,2-DCA | ND | ND | 0.00003 |
| 1,1,1-TCA | ND | ND | 0.00003 |
| Carbon tetrachloride | ND | ND | 0.0001 |
| Bromodichloromethane | ND | ND | 0.0001 |
| 1,2-Dichloropropane | ND | ND | 0.00004 |
| trans-1,3-Dichloropropane | ND | ND | 0.0003 |
| TCE | ND | ND | 0.0001 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | 0.0002 |
| Chloroethylvinyl ether | ND | ND | 0.0001 |
| Bromoform | ND | ND | 0.0002 |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | 0.0003 |
| Chlorobenzene | ND | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | 0.0003 |
| Surrogate Recovery | 77 | 83 | |
| Analysis Date: | 11/19/85 | 11/19/85 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 8010 QC

| Sample ID#: | Method Blank | Method Blank | Duplicate 904279 | 904283 % Recovery (Spike Level 0.005 µg/g) | 904286 % Recovery (Spike Level 0.005 µg/g) |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Chloromethane | ND | ND | ND | 100 | 118 |
| Bromomethane | ND | ND | ND | 126 | 140 |
| Dichlorodifluoromethane | ND | ND | ND | NS | NS |
| Vinyl chloride | ND | ND | ND | 106 | 112 |
| Chloroethane | ND | ND | ND | 92 | 98 |
| Methylene chloride | 0.0007 | 0.0006 | 0.002* | 112 | 116 |
| Trichlorofluoromethane | ND | ND | ND | 104 | 104 |
| 1,1-DCE | ND | ND | ND | 108 | 106 |
| 1,1-DCA | ND | ND | ND | 102 | 104 |
| trans-1,2-DCE | ND | ND | ND | 100 | 104 |
| Chloroform | ND | ND | 0.0002 | 98 | 102 |
| 1,2-DCA | ND | ND | ND | 98 | 96 |
| 1,1,1-TCA | ND | ND | ND | 96 | 102 |
| Carbon tetrachloride | ND | ND | ND | 98 | 100 |
| Bromodichloromethane | ND | ND | ND | 100 | 100 |
| 1,2-Dichloropropane | ND | ND | ND | 94 | 98 |
| trans-1,3-Dichloropropane | ND | ND | ND | 94 | 108 |
| TCE | ND | ND | ND | 98 | 102 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | 93 | 93 |
| Chloroethylvinyl ether | ND | ND | ND | NS | NS |
| Bromoform | ND | ND | ND | 84 | 88 |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | 92 | 103 |
| Chlorobenzene | ND | ND | ND | 90 | 102 |
| Dichlorobenzenes | ND | ND | 0.0008 | 89 | 93 |
| Surrogate Recovery | NS | NS | 54 | 83 | 88 |
| Analysis Date: | 11/19/85 | 12/17/85 | 12/17/85 | 11/20/85 | 11/20/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level
NS - Not spiked

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904253 | 904256 | 904258 | 904260 |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Benzene | ND | 0.0002 | 0.0003 | ND |
| Toluene | ND | 0.0003 | 0.0006 | 0.0002 |
| Ethylbenzene | 0.0036 | 0.0015 | 0.0029 | 0.0008 |
| Chlorobenzene[1] | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 12/16/85 | 12/16/85 | 12/16/85 | 12/16/85 |
| % Surrogate Recovery | 108 | 167 | 118 | 78 |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904262 | 904264 | 904266 | 904268 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | 0.0003 | 0.0003 | 0.0004 |
| Toluene | 0.0002 | 0.0005 | 0.0006 | 0.0004 |
| Ethylbenzene | 0.0011 | 0.0009 | 0.0013 | 0.0007 |
| Chlorobenzene[1] | ND | 0.0003 | 0.0003 | ND |
| Xylenes[2] | ND | 0.0003 | 0.0003 | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 12/16/85 | 12/16/85 | 12/16/85 | 12/16/85 |
| % Surrogate Recovery | 91 | 96 | 82 | 90 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904279 | 904280 | 904282 | 904283 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | ND |
| Toluene | 0.0005 | 0.0003 | 0.0002 | ND |
| Ethylbenzene | 0.0017 | 0.0009 | 0.0013 | 0.0009 |
| Chlorobenzene[1] | 0.0003 | 0.0003 | ND | ND |
| Xylenes[2] | ND | ND | ND | ND |
| Dichlorobenzenes | 0.0006 | ND | ND | ND |
| Analysis Date: | 12/17/85 | 12/17/85 | 12/17/85 | 12/17/85 |
| % Surrogate Recovery | 96 | 86 | 110 | 93 |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

Table 3. 8020 Results
(Concluded)

| Sample ID#: | 904284 | 904286 | Detection Limit |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Benzene | ND | ND | 0.0002 |
| Toluene | ND | ND | 0.0002 |
| Ethylbenzene | 0.0008 | 0.0008 | 0.0002 |
| Chlorobenzene[1] | ND | ND | 0.0002 |
| Xylenes[2] | ND | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | 0.0004 |
| Analysis Date: | 12/17/85 | 12/17/85 | |
| % Surrogate Recovery | 94 | 92 | |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 4. 8020 QC

| Sample ID#: | Method Blank | Duplicate 904258 | 904258 % Recovery (Spike Level 0.005 μg/g) |
|---|---|---|---|
| Compound | Concentration μg/g | | |
| Benzene | ND | ND | 98 |
| Toluene | 0.0004 | 0.0003 | 97 |
| Ethylbenzene | 0.0009 | 0.0015 | 98 |
| Chlorobenzene[1] | ND | ND | 94 |
| Xylenes[2] | ND | ND | 94 |
| Dichlorobenzenes | ND | ND | 89 |
| Analysis Date: | 12/17/85 | 12/17/85 | |
| % Surrogate Recovery | NS* | 64 | 86 |

1 Chlorobenzene and meta-xylene
2 Ortho-xylene and para-xylene
* Not spiked

Table 5. 509A Results

| Sample ID#: | 904270 | 904271 | 904273 | 904274 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Aldrin | ND | ND | ND | ND |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | ND | ND | ND | ND |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |

ND - Not detected

Table 5. 509A Results
(Concluded)

| Sample ID#: | 904276 | 904277 | Detection Limit |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Aldrin | ND | ND | 0.008 |
| Dieldrin | ND | ND | 0.02 |
| Chlordane | ND | ND | 0.08 |
| 4,4'-DDT | ND | ND | 0.02 |
| 4,4'-DDE | 0.04 | ND | 0.02 |
| 4,4'-DDD | ND | ND | 0.02 |
| alpha-Endosulfan | ND | ND | 0.08 |
| beta-endosulfan | ND | ND | 0.02 |
| Endosulfan sulfate | ND | ND | 0.02 |
| Endrin | ND | ND | 0.02 |
| Endrin aldehyde | ND | ND | 0.02 |
| Heptachlor | ND | ND | 0.008 |
| Heptachlor epoxide | ND | ND | 0.008 |
| alpha-BHC | ND | ND | 0.008 |
| beta-BHC | ND | ND | 0.008 |
| delta-BHC | ND | ND | 0.008 |
| gamma-BHC (Lindane) | ND | ND | 0.008 |
| Toxaphene | ND | ND | 0.2 |
| Strobane | ND | ND | 0.2 |
| Dichloran | ND | ND | 0.008 |
| PCNB | ND | ND | 0.008 |
| Captan | ND | ND | 0.02 |
| Mirex | ND | ND | 0.02 |
| Methoxychlor | ND | ND | 0.08 |

ND - Not detected

Table 6. 509A QC

| Sample ID#: | Method Blank | Duplicate 904271 | Duplicate 904273 |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Aldrin | ND | ND | ND |
| Dieldrin | ND | ND | ND |
| Chlordane | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND |
| alpna-Endosulfan | ND | ND | ND |
| beta-endosulfan | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND |
| Endrin | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND |
| Heptachlor | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND |
| alpha-BHC | ND | ND | ND |
| beta-BHC | ND | ND | ND |
| delta-BHC | ND | ND | ND |
| gamma-BHC (Lindane) | ND | ND | ND |
| Toxaphene | ND | ND | ND |
| Strobane | ND | ND | ND |
| Dichloran | ND | ND | ND |
| PCNB | ND | ND | ND |
| Captan | ND | ND | ND |
| Mirex | ND | ND | ND |
| Methoxychlor | ND | ND | ND |

ND - Not detected

Table 7. 509B Results

| Sample ID#: | 904270 | 904271 | 904273 | 904274 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| 2,4-D | ND | ND | ND | ND |
| 2,4,5-T | ND | ND | ND | ND |
| Silvex | ND | ND | ND | ND |

ND - Not detected

Table 7. 509B Results
(Concluded)

| Sample ID#: | 904276 | 904277 | Detection Limit[1] |
|---|---|---|---|
| Compound | Concentration μg/g | | |
| 2,4-D | ND | ND | 0.3 |
| 2,4,5-T | ND | ND | 0.1 |
| Silvex | ND | ND | 0.1 |

ND - Not detected

[1] Interferences raised detection limit for all soils.

Table 8. 509B QC

| Sample ID#: | Method Blank |
|---|---|
| Compound | Concentration µg/g |
| 2,4-D | ND |
| 2,4,5-T | ND |
| Silvex | ND |

ND - Not detected

Table 9. General Chemistry Results

| Sample ID | Oil and Grease, μg/g | Phenols, total, μg/g |
|---|---|---|
| 904279 | <100 | <1 |
| 904280 | 100 | <1 |
| 904282 | <100 | <1 |
| 904283 | <100 | <1 |
| 904284 | <100 | <1 |
| 904286 | <100 | <1 |

Table 10. General Chemistry QC

| Sample ID | Oil and Grease, µg/g |
|---|---|
| Method Blank | <100 |
| 904286 duplicate | <100 |
| 904286 spiked at 290 µg/g | 109% Recovery |

| | Phenols, total, µg/g |
|---|---|
| Method Blank | <1 |
| 904286 duplicate | <1 |

Table 11. Semivolatile Organics Results

| Sample ID#: | 904253 | 904256 | 904258 | 904260 |
|---|---|---|---|---|
| **Priority Pollutants** | Concentration (µg/g) | | | |
| Bis(2-ethylhexyl)phthalate | 4.3 | ND | 0.13 | 0.01 |
| Benzyl butyl phthalate | ND | ND | 0.05 | ND |
| All Other Priority Pollutants | ND | ND | ND | ND |
| Detection Limit | 0.03 | 0.03 | 0.03 | 0.03 |
| **Surrogate Recoveries** | Percent (%) | | | |
| 2-Fluorophenol | 59 | 47 | 74 | 69 |
| Phenol-$d_5$ | 50 | 38 | 60 | 56 |
| Nitrobenzene-$d_5$ | 46 | 38 | 62 | 58 |
| 2-Fluorobiphenyl | 48 | 36 | 66 | 50 |
| 2,4,6-Tribromophenol | 64 | 55 | 61 | 58 |
| Terphenyl-$d_{14}$ | 62 | 48 | 70 | 72 |

ND - Not Detected

Note: All phthalates within normal laboratory background levels except 904253.

Table 11. Semivolatile Organics Results

| Sample ID#: | 904262 | 904264 | 904266 | 904268 |
|---|---|---|---|---|
| **Priority Pollutants** | Concentration (μg/g) | | | |
| Bis(2-ethylhexyl)phthalate | 0.16 | 0.10 | 0.13 | 0.10 |
| Benzyl butyl phthalate | ND | 0.07 | 0.08 | 0.05 |
| All Other Priority Pollutants | ND | ND | ND | ND |
| Detection Limit | 0.03 | 0.03 | 0.03 | 0.03 |
| **Surrogate Recoveries** | Percent (%) | | | |
| 2-Fluorophenol | 68 | 77 | 87 | 84 |
| Phenol-$d_5$ | 55 | 63 | 71 | 67 |
| Nitrobenzene-$d_5$ | 60 | 68 | 74 | 72 |
| 2-Fluorobiphenyl | 52 | 58 | 64 | 62 |
| 2,4,6-Tribromophenol | 44 | 39 | 68 | 46 |
| Terphenyl-$d_{14}$ | 70 | 68 | 80 | 72 |

ND - Not Detected

Note: All phthalates within normal laboratory background levels except 904253.

Table 12. Semivolatile Organics QC

| Sample ID#: | Method Blank | 904268 Duplicate |
| --- | --- | --- |
| Priority Pollutants | Concentration (µg/g) | |
| Bis(2-ethylhexyl)phthalate | 0.07 | 0.12 |
| Benzyl butyl phthalate | ND | ND |
| Di-n-butyl phthalate | ND | 0.64 |
| All Other Priority Pollutants | ND | ND |
| Detection Limit | 0.03 | 0.03 |
| Surrogate Recoveries | Percent (%) | |
| 2-Fluorophenol | 83 | 63 |
| Phenol-$d_5$ | 70 | 56 |
| Nitrobenzene-$d_5$ | 74 | 36 |
| 2-Fluorobiphenyl | 62 | 33 |
| 2,4,6-Tribromophenol | 40 | 61 |
| Terphenyl-$d_{14}$ | 68 | 43 |

ND - Not Detected

10416K

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AeroVironment Inc.

# CHEMICAL ANALYSIS OF SOIL SAMPLES

DECEMBER 30, 1985

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

ACUREX Corporation

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

December 30, 1985
Acurex ID#: 8511-035


Attention: Chris Lovedahl

Subject: Three Soils for Analysis; Received 11/15/85

Selected samples were analyzed following EPA method 8010 using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1. QC results for Method 8010 are presented in Table 2.

Selected samples were analyzed following EPA Method 8020 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

The method 8020 analyses were delayed due to the PID detector breaking and the inability of HNU to provide a replacement part. When HNU finally sent a replacement, it turned out to be defective. At that point, Acurex obtained a Varian PID which was employed in the analyses. Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 8020 are presented in Table 4.

Selected samples were analyzed for pesticides following Method 509A and herbicides following Method 509B (Standard Methods for the Examination of Water and Wastewater, 16th edition). A 3% OV-1 column was employed as the primary

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column for pesticides. A 30 meter DB1 fused silica column was used as the primary column for the herbicides. Samples for pesticide analysis were sonicated in 15% methylene chloride/hexane, concentrated, and then injected into a gas chromatograph operated isothermally. Detection of the eluting compounds were performed with an electron capture detector. Samples for herbicide analysis were extracted with diethyl ether and the extract hydrolyzed. The herbicide acids were methylated and then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of the pesticides and herbicides. Results of the 509A analyses are presented in Table 5 with QC results in Table 6. Results of the 509B analyses are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for oil and grease by sonicating the soil in freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for total phenols by forming a slurry of soil in water, distillation of the slurry, and finally measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 9 with QC results in Table 10.

One soil sample was analyzed for semivolatile organics according to U.S. EPA Method 8270 (Test Methods for Evaluating Solid Waste - SW846, 2nd Ed., 1982). Results are presented in Table 11. The method can be summarized as follows:

> A known amount of sample, approximately 30 g, is serially extracted with methylene chloride. The methylene chloride extracts are combined, dried and concentrated to a volume of 1 mL. The concentrate is injected into GC/MS systems set specifically for the separation and measurement of the priority pollutants. Qualitative identification of the priority pollutants is performed initially using the relative retention times, the relative abundance of three characteristic ions and their ratios. The entire mass spectrum is reviewed before an identification is recorded. Quantitative analysis is performed using an internal standard with a single characteristic ion.

Prior to analysis every sample is spiked with surrogate compounds as part of Acurex's Quality Control Program. These compounds simulate the behavior of compounds of interest and confirm that acceptable recoveries are being achieved on every sample. Other semivolatile QC is reported in Table 12.

Submitted by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila
Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. 8010 Results

| Sample ID#: | 02-04-55 | 05- -55 | Detection Limit |
|---|---|---|---|
| Compound | Concentration μg/g | | |
| Chlorometnane | ND | ND | 0.00008 |
| Bromomethane | ND | ND | 0.001 |
| Dichlorodifluoromethane | ND | ND | 0.002 |
| Vinyl chloride | ND | ND | 0.0002 |
| Chloroethane | ND | ND | 0.0005 |
| Methylene chloride | 0.002* | 0.003* | 0.0002 |
| Trichlorofluoromethane | ND | ND | 0.001 |
| 1,1-DCE | ND | ND | 0.0001 |
| 1,1-DCA | ND | ND | 0.00007 |
| trans-1,2-DCE | ND | ND | 0.0001 |
| Chloroform | 0.0004 | 0.0004 | 0.00005 |
| 1,2-DCA | ND | ND | 0.00003 |
| 1,1,1-TCA | ND | ND | 0.00003 |
| Carbon tetrachloride | ND | ND | 0.0001 |
| Bromodichloromethane | ND | ND | 0.0001 |
| 1,2-Dichloropropane | ND | ND | 0.00004 |
| trans-1,3-Dichloropropane | ND | ND | 0.0003 |
| TCE | ND | 0.002 | 0.0001 |
| Dibromochloromethane[a] | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | 0.0002 |
| cis-1,3-Dichloropropane[a] | | | |
| Chloroethylvinyl ether | ND | ND | 0.0001 |
| Bromoform | ND | ND | 0.0002 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | 0.0003 |
| Chlorobenzene | ND | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | 0.0003 |
| Surrogate Recovery[c] | 99% | 91% | |
| Analysis Date: | 11/19/85 | 11/20/85 | |

a - These compounds coelute
b - These compounds coelute
c - Dibromomethane
* - Below normal laboratory background level

Table 2. 8010 QC

| Sample ID#: | Method Blank |
|---|---|
| **Compound** | **Concentration µg/g** |
| Chloromethane | ND |
| Bromomethane | ND |
| Dichlorodifluoromethane | ND |
| Vinyl chloride | ND |
| Chloroethane | ND |
| Methylene chloride | 0.002 |
| Trichlorofluoromethane | ND |
| 1,1-DCE | ND |
| 1,1-DCA | ND |
| trans-1,2-DCE | ND |
| Chloroform | 0.0003 |
| 1,2-DCA | ND |
| 1,1,1-TCA | ND |
| Carbon tetrachloride | ND |
| Bromodichloromethane | ND |
| 1,2-Dichloropropane | ND |
| trans-1,3-Dichloropropane | ND |
| TCE | ND |
| Dibromochloromethane[a] | |
| 1,1,2-Trichloroethane[a] | ND |
| cis-1,3-Dichloropropane[a] | |
| Chloroethylvinyl ether | ND |
| Bromoform | ND |
| Tetrachloroethane[b] | ND |
| Tetrachloroethene[b] | |
| Chlorobenzene | ND |
| Dichlorobenzenes | ND |
| Surrogate Recovery[c] | 59% |
| Analysis Date: | 11/19/85 |

a - These compounds coelute
b - These compounds coelute
c - Dibromethane
* - Below normal laboratory background level
NS - Not spiked

Table 3. 8020 Results

| Sample ID#: | 02-04-55 | 05-01-55 | Detection Limit |
|---|---|---|---|
| Compound | Concentration ug/g | | |
| Benzene | ND | ND | 0.0002 |
| Toluene | 0.0003 | 0.0002 | 0.0002 |
| Ethylbenzene | 0.0005 | 0.0004 | 0.0002 |
| Chlorobenzene[1] | 0.0002 | ND | 0.0002 |
| Xylenes[2] | 0.0004 | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | 0.0004 |
| Analysis Date: | 12/11/85 | 12/11/85 | |
| % Surrogate Recovery | 87 | 95 | |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 4. 8020 QC

| Sample ID#: | Method Blank |
|---|---|
| Compound | Concentration µg/g |
| Benzene | ND |
| Toluene | 0.003 |
| Ethylbenzene | 0.001 |
| Chlorobenzene[1] | ND |
| Xylenes[2] | ND |
| Dichlorobenzenes | ND |
| Analysis Date: | 12/11/85 |
| % Surrogate Recovery | NA* |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

* Not added

Table 5. 509A Results

| Sample ID#: | 12-01-54 | Detection Limit |
|---|---|---|
| Compound | Concentration µg/g | |
| Aldrin | ND | 0.008 |
| Dieldrin | ND | 0.02 |
| Chlordane | ND | 0.08 |
| 4,4'-DDT | ND | 0.02 |
| 4,4'-DDE | ND | 0.02 |
| 4,4'-DDD | ND | 0.02 |
| alpha-Endosulfan | ND | 0.08 |
| beta-endosulfan | ND | 0.02 |
| Endosulfan sulfate | ND | 0.02 |
| Endrin | ND | 0.02 |
| Endrin aldehyde | ND | 0.02 |
| Heptachlor | ND | 0.008 |
| Heptachlor epoxide | ND | 0.008 |
| alpha-BHC | ND | 0.008 |
| beta-BHC | ND | 0.008 |
| delta-BHC | ND | 0.008 |
| gamma-BHC (Lindane) | ND | 0.008 |
| Toxaphene | ND | 0.2 |
| Strobane | ND | 0.2 |
| Dichloran | ND | 0.008 |
| PCNB | ND | 0.008 |
| Captan | ND | 0.02 |
| Mirex | ND | 0.02 |
| Methoxychlor | ND | 0.08 |

ND - Not detected

Table 6. 509A QC

| Sample ID#: | Method Blank | 12-01-54 % Recovery | Spike Level |
|---|---|---|---|
| Compound | Concentration ug/g | | |
| Aldrin | ND | 103 | 0.027 |
| Dieldrin | ND | 95 | 0.067 |
| Chlordane | ND | NS | ND |
| 4,4'-DDT | ND | 107 | 0.067 |
| 4,4'-DDE | ND | NS | ND |
| 4,4'-DDD | ND | NS | ND |
| alpha-Endosulfan | ND | NS | ND |
| beta-endosulfan | ND | NS | ND |
| Endosulfan sulfate | ND | NS | ND |
| Endrin | ND | 94 | 0.067 |
| Endrin aldehyde | ND | NS | ND |
| Heptachlor | ND | 104 | 0.027 |
| Heptachlor epoxide | ND | NS | ND |
| alpha-BHC | ND | NS | ND |
| beta-BHC | ND | NS | ND |
| delta-BHC | ND | NS | ND |
| gamma-BHC (Lindane) | ND | 100 | 0.027 |
| Toxaphene | ND | NS | ND |
| Strobane | ND | NS | ND |
| Dichloran | ND | NS | ND |
| PCNB | ND | NS | ND |
| Captan | ND | NS | ND |
| Mirex | ND | NS | ND |
| Methoxychlor | ND | NS | ND |

ND - Not detected

NS - Not spiked

Table 7. 509B Results

| Sample ID#: | 12-01-54[1] | Detection Limit |
|---|---|---|
| Compound | Concentration µg/g | |
| 2,4-D | ND | 0.3 |
| 2,4,5-T | ND | 0.1 |
| Silvex | ND | 0.1 |

ND - Not detected

[1] Detection limit raised due to interferences.

Table 8. 509B QC

| Sample ID#: | Method Blank |
|---|---|
| Compound | Concentration µg/g |
| 2,4-D | ND |
| 2,4,5-T | ND |
| Silvex | ND |

ND - Not detected

Table 9. General Chemistry Results

| Sample ID | Oil and Grease, µg/g | Phenols, total, µg/g |
|---|---|---|
| 05-01-55 | <100 | <1 |

Table 10. General Chemistry QC

| Sample ID | Oil and Grease, µg/g |
| --- | --- |
| Method Blank | <100 |

| | Phenols, total, µg/g |
| --- | --- |
| Method Blank | <1 |

Table 11. Semivolatile Organics Results

| Sample ID#: | 02-04-55 |
|---|---|
| **Priority Pollutants** | **Concentration (ug/g)** |
| Pentachlorophenol | 30 |
| Benzyl butyl phthalate | 0.23 |
| All Other Priority Pollutants | ND |
| Detection Limit | 0.03 |
| **Surrogate Recoveries** | **Percent (%)** |
| 2-Fluorophenol | 85 |
| Phenol-$d_5$ | 73 |
| Nitrobenzene-$d_5$ | 66 |
| 2-Fluorobiphenyl | 62 |
| 2,4,6-Tribromophenol | 78 |
| Terphenyl-$d_{14}$ | 56 |

ND - Not Detected

Table 12. Semivolatile Organics QC

| Sample ID#: | Method Blank |
|---|---|
| **Priority Pollutants** | **Concentration (µg/g)** |
| All | ND |
| Detection Limit | 0.03 |
| **Surrogate Recoveries** | **Percent (%)** |
| 2-Fluorophenol | 83 |
| Phenol-$d_5$ | 69 |
| Nitrobenzene-$d_5$ | 74 |
| 2-Fluorobiphenyl | 62 |
| 2,4,6-Tribromophenol | 40 |
| Terphenyl-$d_{14}$ | 68 |

ND - Not Detected

RECEIVED
JAN 13 1986
AeroVironment Inc.

# CHEMICAL ANALYSIS OF SOIL SAMPLES

JANUARY 7, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

# ACUREX Corporation

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

January 7, 1986
Acurex ID#: 8511-039


Attention: Chris Lovedahl

Subject: Thirty-three Soils for Analysis; Received 11/19/85

Selected samples were analyzed following EPA method 8010 using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1 including recoveries of dibromethane which was employed as a surrogate. QC results for Method 8010 are presented in Table 2.

Selected samples were analyzed following EPA Method 8020 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

The method 8020 analyses were delayed due to the PID detector breaking and the inability of HNU to provide a replacement part. When HNU finally sent a replacement, it turned out to be defective. At that point, Acurex obtained a Varian PID which was employed in the analyses. Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 8020 are presented in Table 4.

Selected samples were analyzed for oil and grease by sonicating the soil in freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 5 with QC results in Table 6.

Selected samples were analyzed for total phenols by forming a slurry of soil in water, distillation of the slurry, and finally measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 5 with QC results in Table 6.

Selected samples were analyzed for petroleum hydrocarbons by sonicating the soil in Freon (EPA Method 3550), passing the extract across silica gel, and then analyzing the solvent by infrared spectgroscopy using EPA method 413.2. Results are presented in Table 5 with QC results in Table 6.

Selected samples were analyzed for lead by rigorous digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 5 with QC results in Table 6.

Submitted by:

Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

Table 1. 8010 Results

| Sample ID#: | 810723 | 810724 | 810725 | 810726 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.002* | 0.002* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.001 | 0.0006 | 0.0005 | 0.0005 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | 0.0004 | ND | ND | 0.00003 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | 0.0001 | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 87 | 80 | 99 | 92 |
| Analysis Date: | 11/20/85 | 11/20/85 | 11/20/85 | 11/20/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810727 | 810728 | 810729 | 810731 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | 0.0008 | 0.0001 | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.002* | 0.003* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | 0.0001 |
| Chloroform | 0.0005 | 0.0004 | 0.0006 | 0.0003 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | 0.00004 | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | 0.0002 | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 78 | 87 | 93 | 65 |
| Analysis Date: | 11/20/85 | 11/20/85 | 11/21/85 | 11/24/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810733 | 810735 | 810739 | 810740 |
| --- | --- | --- | --- | --- |
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.004* | 0.004* | 0.002* | 0.003* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0004 | 0.0003 | 0.0002 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dicnloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 63 | 71 | 54 | 80 |
| Analysis Date: | 11/21/85 | 11/21/85 | 11/21/85 | 11/21/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810742 | 810746 | 810747 | 810748 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.004* | 0.002* | 0.003* | 0.003* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0003 | 0.0003 | 0.0004 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 61 | 69 | 74 | 74 |
| Analysis Date: | 11/21/85 | 11/21/85 | 11/21/85 | 11/21/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810749 | 810750 | 811472 | 811476 |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.003* | 0.002* | 0.002* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0003 | ND | 0.0004 | 0.0003 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | ND | ND |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 72 | 65 | 73 | 59 |
| Analysis Date: | 11/21/85 | 11/21/85 | 11/22/85 | 11/22/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 811477 | 811479 | 811481 | 811485 |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.003* | 0.004* | 0.003* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0002 | 0.0003 | 0.0005 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 48 | 66 | 63 | 60 |
| Analysis Date: | 11/22/85 | 11/22/85 | 11/22/85 | 11/22/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID*: | 811486 | 811488 | 811490 | 811494 |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.003* | 0.002* | 0.003* | 0.001* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0005 | 0.0004 | 0.0004 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 90 | 53 | 59 | 60 |
| Analysis Date: | 11/22/85 | 11/22/85 | 11/22/85 | 11/22/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 904287 | 904288 | 904290 | 904291 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.001* | 0.001* | 0.001* | 0.001* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0003 | 0.0003 | 0.0003 | 0.0003 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery | 80 | 75 | 65 | 70 |
| Analysis Date: | 11/22/85 | 11/22/85 | 11/22/85 | 11/22/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Concluded)

| Sample ID#: | 904292 | Detection Limit |
|---|---|---|
| Compound | Concentration µg/g | |
| Chloromethane | ND | 0.00008 |
| Bromomethane | ND | 0.001 |
| Dichlorodifluoromethane | ND | 0.002 |
| Vinyl chloride | ND | 0.0002 |
| Chloroethane | ND | 0.0005 |
| Methylene chloride | 0.001* | 0.0002 |
| Trichlorofluoromethane | ND | 0.001 |
| 1,1-DCE | ND | 0.0001 |
| 1,1-DCA | ND | 0.00007 |
| trans-1,2-DCE | ND | 0.0001 |
| Chloroform | 0.0003 | 0.00005 |
| 1,2-DCA | ND | 0.00003 |
| 1,1,1-TCA | ND | 0.00003 |
| Carbon tetrachloride | ND | 0.0001 |
| Bromodichloromethane | ND | 0.0001 |
| 1,2-Dichloropropane | ND | 0.00004 |
| trans-1,3-Dichloropropane | ND | 0.0003 |
| TCE | ND | 0.0001 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | 0.0002 |
| Chloroethylvinyl ether | ND | 0.0001 |
| Bromoform | ND | 0.0002 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | 0.0003 |
| Chlorobenzene | ND | 0.0002 |
| Dichlorobenzenes | ND | 0.0003 |
| Surrogate Recovery | 67 | |
| Analysis Date: | 11/22/85 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 8010 QC

| Sample ID#: | Method Blank | Method Blank | Method Blank | Method Blank |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.0009 | 0.001 | 0.001 | 0.001 |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0004 | ND | 0.001 | 0.0009 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | 0.00004 | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | 0.001 | ND | ND | ND |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogatge Recovery | NS | NS | NS | NS |
| Analysis Date: | 11/21/85 | 11/22/85 | 11/19/85 | 11/19/85 |

a - These compounds coelute
b - These compounds coelute
NS - Not spiked

Table 2. 8010 QC

| Sample ID#: | Duplicate 811481 | Duplicate 810731 | Duplicate 810742 | 810731 % Recovery (Spike Level 0.005 µg/g) |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | 98 |
| Bromomethane | ND | ND | ND | 48 |
| Dichlorodifluoromethane | ND | ND | ND | NS |
| Vinyl chloride | ND | ND | ND | 77 |
| Chloroethane | ND | ND | ND | 77 |
| Methylene chloride | 0.004* | 0.002* | 0.003* | 114 |
| Trichlorofluoromethane | ND | ND | ND | 80 |
| 1,1-DCE | ND | ND | ND | 80 |
| 1,1-DCA | ND | ND | ND | 78 |
| trans-1,2-DCE | ND | ND | ND | 78 |
| Chloroform | 0.001 | 0.001 | 0.0009 | 78 |
| 1,2-DCA | ND | ND | ND | 79 |
| 1,1,1-TCA | ND | ND | ND | 82 |
| Carbon tetrachloride | ND | ND | ND | 79 |
| Bromodichloromethane | ND | ND | ND | 79 |
| 1,2-Dichloropropane | ND | ND | ND | 75 |
| trans-1,3-Dichloropropane | ND | ND | ND | 75 |
| TCE | ND | ND | ND | 77 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | 76 |
| Chloroethylvinyl ether | ND | ND | ND | 81 |
| Bromoform | ND | ND | ND | 32 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | 76 |
| Chlorobenzene | ND | ND | ND | 68 |
| Dichlorobenzenes | ND | ND | ND | 63 |
| Surrogate Recovery | 108 | 76 | 84 | NS |
| Analysis Date: | 12/19/85 | 12/19/85 | 12/19/85 | 12/19/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level
NS - Not spiked

Table 3. 8020 Results

| Sample ID#: | 810723 | 810724 | 810725 | 810726 | 810727 |
|---|---|---|---|---|---|
| Compound | Concentration ug/g | | | | |
| Benzene | ND | ND | ND | 0.0003 | 0.0002 |
| Toluene | 0.0003 | ND | 0.0003 | 0.0004 | 0.0004 |
| Ethylbenzene | 0.0021 | 0.0016 | 0.0010 | 0.0006 | 0.0006 |
| Chlorobenzene[1] | 0.0003 | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 12/17/85 | 12/17/85 | 12/17/85 | 12/17/85 | 12/17/85 |
| % Surrogate Recovery | 81 | 91 | 95 | 87 | 87 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 810731 | 810733 | 810735 | 810740 | 810739 |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Benzene | 0.0003 | ND | ND | ND | ND |
| Toluene | 0.0004 | 0.0004 | 0.0002 | 0.002 | ND |
| Ethylbenzene | 0.0013 | 0.0007 | 0.0008 | 0.0010 | 0.0010 |
| Chlorobenzene[1] | 0.0003 | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 12/18/85 | 12/18/85 | 12/18/85 | 12/18/85 | 12/18/85 |
| % Surrogate Recovery | 68 | 73 | 90 | 91 | 82 |

1 Chlorobenzene and meta-xylene
2 Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 810742 | 810746 | 810747 | 810750 | 810749 |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Benzene | ND | 0.0003 | 0.0002 | ND | ND |
| Toluene | 0.0002 | 0.0004 | 0.0004 | 0.0002 | ND |
| Ethylbenzene | 0.0009 | 0.0009 | 0.0008 | 0.0008 | 0.0007 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 12/18/85 | 12/18/85 | 12/18/85 | 12/18/85 | 12/18/85 |
| % Surrogate Recovery | 82 | 98 | 98 | 96 | 65 |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 811472 | 811476 |
|---|---|---|
| Compound | Concentration µg/g | |
| Benzene | ND | 0.0002 |
| Toluene | 0.0003 | 0.0004 |
| Ethylbenzene | 0.0008 | 0.0007 |
| Chlorobenzene[1] | ND | ND |
| Xylenes[2] | ND | ND |
| Dichlorobenzenes | ND | ND |
| Analysis Date: | 12/18/85 | 12/18/85 |
| % Surrogate Recovery | 101 | 92 |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 811477 | 811479 | 811481 | 811485 | 811486 |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Benzene | 0.0003 | ND | ND | ND | ND |
| Toluene | 0.0006 | 0.0005 | 0.0003 | 0.0005 | 0.0003 |
| Ethylbenzene | 0.0012 | ND | 0.0008 | 0.0010 | 0.0009 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 12/19/85 | 12/19/85 | 12/19/85 | 12/19/85 | 12/19/85 |
| % Surrogate Recovery | 74 | 89 | 96 | 86 | 84 |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 811488 | 811490 | 811494 |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Benzene | ND | ND | ND |
| Toluene | 0.0003 | 0.0003 | 0.0003 |
| Ethylbenzene | 0.0009 | 0.0019 | 0.0010 |
| Chlorobenzene[1] | ND | ND | ND |
| Xylenes[2] | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND |
| Analysis Date: | 12/19/85 | 12/19/85 | 12/19/85 |
| % Surrogate Recovery | 55 | 87 | 80 |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 904287 | 904288 | 904290 | 904291 | 904292 |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Benzene | 0.0004 | 0.0006 | 0.0004 | 0.0003 | 0.0004 |
| Toluene | 0.0007 | 0.0008 | 0.0007 | 0.0007 | 0.0007 |
| Ethylbenzene | 0.0011 | 0.0016 | 0.0009 | 0.0011 | 0.0012 |
| Chlorobenzene[1] | 0.0004 | 0.0005 | 0.0004 | 0.0005 | 0.0004 |
| Xylenes[2] | 0.0004 | 0.0004 | ND | 0.0004 | ND |
| Dichlorobenzenes | 0.0011 | 0.0006 | 0.0009 | 0.0007 | 0.0009 |
| Analysis Date: | 12/20/85 | 12/20/85 | 12/20/85 | 12/20/85 | 12/20/85 |
| % Surrogate Recovery | 91 | 97 | 84 | 43 | 57 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 3. 8020 Results
(Concluded)

| Sample ID#: | 810728[3] | 810729[3] | 810748[3] | Detection Limit |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | 1.62 | ND | ND | 0.05 |
| Toluene | 0.11 | 0.12 | 0.14 | 0.05 |
| Etnylbenzene | 0.42 | ND | 0.30 | 0.05 |
| Chlorobenzene[1] | ND | ND | ND | 0.05 |
| Xylenes[2] | ND | ND | ND | 0.05 |
| Dichlorobenzenes | ND | ND | ND | 0.10 |
| Analysis Date: | 12/20/85 | 12/20/85 | 12/20/85 | |
| Surrogate Recovery | 172 | 157 | 128 | |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

3 Detettion limit increased by 250. Less sample analyzed due to matrix interferences. High surrogate recovery due to matrix interferences (compounds in sample other than the analytes). Samples are not corrected for recovery.

Table 4. 8020 QC

| Sample ID#: | Method Blank | Storage Blank | Duplicate 904290 | Duplicate[3] 810748 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | 0.0082 | ND | 0.0002 | ND |
| Toluene | 0.0005 | ND | 0.0005 | 0.18 |
| Ethylbenzene | 0.0002 | 0.0007 | 0.0002 | 0.31 |
| Chlorobenzene[1] | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 12/20/85 | 12/20/85 | 12/21/85 | 12/20/85 |
| % Surrogate Recovery | NA* | 66 | 83 | 113 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

[3] Detection Limit increased by 250

* Not added

Table 4. 8020 QC (Concluded)

| Sample ID#: | Duplicate 810723 | Duplicate 810739 | 810733 % Recovery (Spike Level 0.005 µg/g) |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Benzene | 0.003 | 0.0002 | 80 |
| Toluene | 0.005 | 0.0005 | 85 |
| Ethylbenzene | 0.0011 | 0.0008 | 78 |
| Chlorobenzene[1] | ND | ND | 79 |
| Xylenes[2] | ND | ND | 77 |
| Dichlorobenzenes | ND | ND | 74 |
| Analysis Date: | 12/20/85 | 12/20/85 | 12/20/85 |
| % Surrogate Recovery | 69 | 52 | 81 |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene
* Not added

Table 5. General Chemistry Results

| Sample ID | Lead, µg/g | Oil and Grease, 230g/g | Petroleum Hydrocarbons, µg/g | Phenols, total, µg/g |
|---|---|---|---|---|
| 810723 | NA | 400 | NA | <1 |
| 810724 | NA | 400 | NA | <1 |
| 810725 | NA | 400 | NA | <1 |
| 810726 | NA | 400 | NA | <1 |
| 810727 | NA | 400 | NA | <1 |
| 810728 | NA | 4,000 | NA | <1 |
| 810729 | NA | 1,100 | NA | <1 |
| 810731 | 11 | 400 | 400 | <1 |
| 810733 | 12 | <100 | <100 | <1 |
| 810735 | 6 | <100 | <100 | <1 |
| 810739 | 7 | 400 | 300 | <1 |
| 810740 | 12 | 400 | 300 | <1 |
| 810742 | 10 | 400 | 300 | <1 |
| 810746 | 6 | 400 | 300 | <1 |
| 810747 | 13 | 400 | 300 | <1 |
| 810748 | NA | 400 | NA | <1 |
| 810749 | NA | 700 | NA | <1 |
| 810750 | NA | 400 | NA | <1 |
| 811472 | 4 | 400 | 300 | <1 |
| 811476 | 8 | 400 | 300 | <1 |
| 811477 | 10 | 400 | 300 | <1 |
| 811479 | 7 | 400 | 300 | <1 |
| 811481 | 8 | 400 | 300 | <1 |
| 811485 | 7 | 400 | 300 | <1 |
| 811486 | 9 | 100 | <100 | <1 |
| 811488 | 8 | <100 | <100 | <1 |
| 811490 | 10 | <100 | <100 | <1 |
| 811494 | 7 | <100 | <100 | <1 |
| 904287 | NA | <100 | NA | <1 |
| 904288 | NA | <100 | NA | <1 |
| 904290 | NA | <100 | NA | <1 |
| 904291 | NA | 500 | NA | <1 |
| 904292 | NA | <100 | NA | <1 |

NA - Not analyzed

Table 6. General Chemistry QC

| Sample ID | Lead, μg/g |
|---|---|
| Method Blank | <1 |
| Method Blank | <1 |
| 810733 duplicate | 10 |
| 810742 duplicate | 7 |
| 811479 spiked at 40 μg/g | 94% Recovery |
| | **Oil and Grease, μg/g** |
| Method Blank | <100 |
| 810749 duplicate | 800 |
| 904291 duplicate | 300 |
| 904292 duplicate | <100 |
| 810733 spiked at 290 μg/g | 91% Recovery |
| 810735 spiked at 290 μg/g | 91% Recovery |
| | **Petroleum Hydrocarbons, μ/g** |
| Method Blank | <100 |
| 810733 duplicate | <100 |
| 810735 duplicate | <100 |
| 810733 spiked at 290 μg/g | 91% Recovery |
| 810735 spiked at 290 μg/g | 91% Recovery |
| | **Phenols, total, μg/g** |
| Method Blank | <1 |
| Method Blank | <1 |
| 811481 duplicate | <1 |
| 811485 duplicate | <1 |
| 904290 duplicate | <1 |
| 811486 spiked at 2.0 μg/g | 62% Recovery |
| 904287 spiked at 2.0 μg/g | 72% Recovery |

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AeroVironment Inc.

# CHEMICAL ANALYSIS OF WATER SAMPLES

DECEMBER 9, 1985

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

ACUREX Corporation

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

December 9, 1985
Acurex ID#: 8511·043


Attention: Chris Lovedahl

Subject: Five Waters for Analysis; Received 11/20/85

Selected samples were analyzed for total phenols by distillation and measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 1 with QC results in Table 2.

Prepared by: Patrick M. Hirata, Chemist

Approved by: Greg Nicoll
Greg Nicoll, Manager, Inorganic Chemistry

PMH/GN/kek



555 Clyde Avenue PO Box 7555 Mountain View CA 94039 (415) 964-3200 Telex 34-6391 TWX 910-3796593

Table 1. Phenols Results

| Sample ID | Phenols, total, µg/L |
|---|---|
| 810753 | 5 |
| 810758 | 10 |
| 810763 | 5 |
| 810768 | 10 |
| 810774 | 3 |

Table 2. Phenols QC

| Sample ID | Phenols, total, μg/g |
| --- | --- |
| Method Blank | <1 |
| 310774 duplicate | 4 |

RECEIVED
JAN 16 1986
AeroVironment Inc.

# CHEMICAL ANALYSIS OF WATER AND SOIL SAMPLES

JANUARY 9, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

ACUREX Corporation

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

January 9, 1986
Acurex ID#: 8511-048


Attention: Chris Lovedahl

Subject: Twenty-nine Water and Twenty-one Soils for Analysis; Received 11/21/85

Selected samples were analyzed following EPA method 8010 for soils and 601 for waters using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 mL of water sample or 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1 including recoveries of dibromethane which was employed as a surrogate. QC results for Method 8010 and Method 601 are presented in Table 2.

Selected samples were analyzed following EPA Method 8020 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

The Method 8020 analyses were delayed due to the PID detector breaking and the inability of HNU to provide a replacement part. When HNU finally sent a replacement, it turned out to be defective. At that point, Acurex obtained a Varian PID which was employed in the analyses. No waters were analyzed by EPA 602 as the holding time was exceeded for the above reason. Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 8020 are presented in Table 4.

555 Clyde Avenue PO Box 7555, Mountain View CA 94039 (415) 964-3200 Telex 34-6391 TWX 910-3796593

Selected samples were analyzed for pesticides following Method 509A and herbicides following Method 509B (Standard Methods for the Examination of Water and Wastewater, 16th edition). A 3% OV-1 column was employed as the primary column for pesticides. A 30 meter DB1 fused silica column was used as the primary column for the herbicides. Samples for pesticide analysis were sonicated in 15% methylene chloride/hexane for soils or extracted with methylene chloride for waters, solvent exchanged, concentrated, and then injected into a gas chromatograph operated isothermally. Detection of the eluting compounds were performed with an electron capture detector. Samples for herbicide analysis were extracted with diethyl ether and the extract hydrolyzed. The herbicide acids were methylated and then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of the pesticides and herbicides. Results of the 509A analyses are presented in Table 5 with QC results in Table 6. Results of the 509B analyses are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for oil and grease by sonicating the soil in freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for total phenols by forming a slurry of soil in water, distillation of the slurry, and finally measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for petroleum hydrocarbons by sonicating the soil in freon (EPA Method 3550), passing the extract across silica gel, and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for lead by rigorous digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for eight metals by rigorous digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 11 with QC results in Table 12.

Submitted by:

Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila
Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. 601 Results

| Sample ID#: | 810744 | 810755 | 810760 | 810765 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 1.4* | 4.6* | 3.9* | 2.2* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 1.4 | 1.1 | 1.2 | 1.1 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | 0.3 | 0.2 | 0.2 | 0.2 |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | 0.04 | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 81 | 84 | 97 | 88 |
| Analysis Date: | 11/25/85 | 11/25/85 | 11/25/85 | 11/25/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 601 Results

| Sample ID#: | 810771 | 810808 | 810831 | Detection Limit |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | 0.08 |
| Bromomethane | ND | ND | ND | 1 |
| Dichlorodifluoromethane | ND | ND | ND | 2 |
| Vinyl chloride | ND | ND | ND | 0.2 |
| Chloroethane | ND | ND | ND | 0.5 |
| Methylene chloride | 1.5* | 2.2* | 2.3* | 0.2 |
| Trichlorofluoromethane | ND | ND | ND | 1 |
| 1,1-DCE | ND | ND | ND | 0.1 |
| 1,1-DCA | ND | ND | ND | 0.07 |
| trans-1,2-DCE | ND | ND | ND | 0.1 |
| Chloroform | 0.3 | 1.0 | 0.8 | 0.05 |
| 1,2-DCA | ND | ND | ND | 0.03 |
| 1,1,1-TCA | ND | ND | 0.1 | 0.03 |
| Carbon tetrachloride | ND | ND | ND | 0.1 |
| Bromodichloromethane | ND | 0.2 | ND | 0.1 |
| 1,2-Dichloropropane | ND | ND | ND | 0.04 |
| trans-1,3-Dichloropropane | ND | ND | ND | 0.3 |
| TCE | 0.3 | ND | ND | 0.1 |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | 0.2 |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | 0.1 |
| Bromoform | ND | ND | ND | 0.2 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | 0.3 |
| Chlorobenzene | ND | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | ND | 0.3 |
| Surrogate Recovery, % | 80 | 74 | 85 | |
| Analysis Date: | 11/25/85 | 11/25/85 | 11/25/85 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results

| Sample ID#: | 810770 | 810776 | 810777 | 810778 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.002* | 0.004* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | 0.0003 | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | ND | 0.0003 | 0.0033 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | 0.0006 | ND | ND | ND |
| Surrogate Recovery, % | 82 | 71 | 79 | 64 |
| Analysis Date: | 12/30/85 | 11/25/85 | 11/25/85 | 11/25/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810791 810792 810793 810794 Composite | 810779 810780 810781 810782 Composite | 810783 810784 810785 810786 Composite | 810787 810788 810789 810790 Composite |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.002* | 0.005* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.0003 | 0.0004 | 0.00042 | 0.00022 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | 0.00008 | ND |
| Carbon tetrachloride | ND | ND | ND | 0.00004 |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 63 | 68 | 64 | 48 |
| Analysis Date: | 11/25/85 | 11/25/85 | 11/26/85 | 11/26/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810801 | 810802 | 810803 | 810805 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.005* | 0.007* | 0.017* | 0.018* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.00056 | ND | 0.00048 | 0.0072 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | 0.00005 | 0.00008 | 0.00004 | 0.00018 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 85 | 99 | 84 | 78 |
| Analysis Date: | 11/26/85 | 11/26/85 | 11/26/85 | 11/26/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810806 | 810807 | 810836 | 810800 |
|---|---|---|---|---|
| Compound | Concentration ug/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.053* | 0.016* | 0.004* | 0.003* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | 0.00018 | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.001 | 0.41 | 0.00055 | 0.00043 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | 0.00005 | ND | 0.00005 | 0.00003 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 108 | 38 | 85 | 78 |
| Analysis Date: | 11/26/85 | 11/26/85 | 11/26/85 | 11/26/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810795 | 810796 | 810797 | 810798 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.002* | 0.004* | 0.005* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.00052 | 0.00034 | 0.00063 | 0.0005 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | 0.00006 | 0.00003 | 0.00005 | 0.00004 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] / 1,1,2-Trichloroethane[a] / cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] / Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 84 | 91 | 76 | 91 |
| Analysis Date: | 11/26/85 | 11/26/85 | 11/27/85 | 11/27/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Concluded)

| Sample ID#: | 810799 | Detection Limit |
|---|---|---|
| Compound | Concentration µg/g | |
| Chloromethane | ND | 0.00008 |
| Bromomethane | ND | 0.001 |
| Dichlorodifluoromethane | ND | 0.002 |
| Vinyl chloride | ND | 0.0002 |
| Chloroethane | ND | 0.0005 |
| Methylene chloride | 0.003* | 0.0002 |
| Trichlorofluoromethane | ND | 0.001 |
| 1,1-DCE | ND | 0.0001 |
| 1,1-DCA | ND | 0.00007 |
| trans-1,2-DCE | ND | 0.0001 |
| Chloroform | 0.0003 | 0.00005 |
| 1,2-DCA | ND | 0.00003 |
| 1,1,1-TCA | 0.00004 | 0.00003 |
| Carbon tetrachloride | ND | 0.0001 |
| Bromodichloromethane | ND | 0.0001 |
| 1,2-Dichloropropane | ND | 0.00004 |
| trans-1,3-Dichloropropane | ND | 0.0003 |
| TCE | ND | 0.0001 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | 0.0002 |
| Chloroethylvinyl ether | ND | 0.0001 |
| Bromoform | ND | 0.0002 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | 0.0003 |
| Chlorobenzene | ND | 0.0002 |
| Dichlorobenzenes | ND | 0.0003 |
| Surrogate Recovery, % | 90 | |
| Analysis Date: | 11/27/85 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 8010 QC

| Sample ID#: | Water[c] Method Blank | Soil Method Blank | Storage Method Blank |
|---|---|---|---|
| Compound | Concentration μg/g | | |
| Chloromethane | ND | ND | ND |
| Bromomethane | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND |
| Vinyl chloride | ND | ND | ND |
| Chloroethane | ND | ND | ND |
| Methylene chloride | 0.9 | 0.001* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND |
| 1,1-DCE | ND | ND | ND |
| 1,1-DCA | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND |
| Chloroform | ND | ND | 0.0005 |
| 1,2-DCA | ND | ND | ND |
| 1,1,1-TCA | ND | 0.00008 | 0.0001 |
| Carbon tetrachloride | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND |
| TCE | ND | ND | ND |
| Dibromochloromethane[a] | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | |
| Chloroethylvinyl ether | ND | ND | ND |
| Bromoform | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | ND |
| Tetrachloroethene[b] | | | |
| Chlorobenzene | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND |
| Surrogate Recovery, % | NS | NS | 110 |
| Analysis Date: | 11/25/85 | 11/26/85 | 11/27/85 |

a - These compounds coelute
b - These compounds coelute
c - Units are μg/L
* - Below normal laboratory background level
NS - Not spiked

Table 2. 8010 QC
(Concluded)

| Sample ID#: | Duplicate 810803 | Duplicate 810770 | 810791 310792 810793 810794 % Recovery (Spike Level 0.005 µg/g) |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Chloromethane | ND | ND | 73 |
| Bromomethane | ND | ND | 75 |
| Dichlorodifluoromethane | ND | ND | NS |
| Vinyl chloride | ND | ND | 75 |
| Chloroethane | ND | ND | 74 |
| Methylene chloride | 0.002* | 0.002* | 77 |
| Trichlorofluoromethane | ND | ND | 79 |
| 1,1-DCE | 0.0002 | 0.0003 | 79 |
| 1,1-DCA | ND | ND | 77 |
| trans-1,2-DCE | ND | ND | 76 |
| Chloroform | ND | ND | 77 |
| 1,2-DCA | ND | ND | 77 |
| 1,1,1-TCA | 0.0001 | ND | 74 |
| Carbon tetrachloride | ND | ND | 75 |
| Bromodichloromethane | ND | ND | 74 |
| 1,2-Dichloropropane | ND | ND | 69 |
| trans-1,3-Dichloropropane | ND | ND | 71 |
| TCE | ND | ND | 70 |
| [illegible]romochloromethane[a] | | | |
| 1,1,2-Tr[illegible]chloroethane[a] | ND | ND | 72 |
| [illegible]-1,3-Dichloropropane[a] | | | |
| [illegible] vinyl ether | ND | ND | 80 |
| [illegible] | ND | ND | 64 |
| [illegible]ethane[b] | ND | ND | 70 |
| [illegible]ene[b] | | | |
| [illegible] | ND | ND | 61 |
| [illegible] | ND | ND | 70 |
| [illegible] | 107 | 83 | NS |
| [illegible] | 12/30/85 | 12/30/85 | 12/30/85 |

[illegible]

Table 3. 8020 Results

| Sample ID#: | 810770 | 810776 | 810777 | 810778 | 810791 810792 810793 810794 |
|---|---|---|---|---|---|
| Compound | Concentration μg/g | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | 0.0002 | ND | ND | ND | ND |
| Ethylbenzene | 0.0006 | 0.0007 | 0.0007 | 0.0006 | 0.0009 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 12/22/85 | 12/22/85 | 12/22/85 | 12/22/85 | 12/22/85 |
| % Surrogate Recovery | 94 | 61 | 74 | 67 | 61 |

1 Chlorobenzene and meta-xylene
2 Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 810779<br>810780<br>810781<br>810782 | 810783<br>810784<br>810785<br>810786 | 810787<br>810788<br>810789<br>810790 | 810801 | 810803 |
|---|---|---|---|---|---|
| Compound | Concentration μg/g | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | 0.0010 | 0.0014 | 0.0006 | 0.0006 | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 12/22/85 | 12/22/85 | 12/22/85 | 12/22/85 | 12/22/85 |
| % Surrogate Recovery | 104 | 55 | 41 | 68 | 52 |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 810805 | 810806 | 810807 | 810836 | 810795 |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Benzene | ND | ND | 0.0003 | 0.0002 | ND |
| Toluene | ND | 0.0002 | 0.0003 | 0.0003 | ND |
| Ethylbenzene | 0.0005 | 0.0009 | 0.0003 | 0.0006 | 0.0008 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 12/22/85 | 12/22/85 | 12/22/85 | 12/22/85 | 12/22/85 |
| % Surrogate Recovery | 64 | 94 | 87 | 46 | 52 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 3. 8020 Results
(Continued)

| Sample ID#: | 810796 | 810797 | 810798 | 810799 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | 0.0003 | 0.0003 | 0.0002 | 0.0002 |
| Toluene | 0.0003 | 0.0004 | 0.0005 | 0.0003 |
| Ethylbenzene | 0.0005 | 0.0006 | 0.0006 | 0.0007 |
| Chlorobenzene[1] | ND | 0.0002 | ND | ND |
| Xylenes[2] | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 12/22/85 | 12/22/85 | 12/22/85 | 12/22/85 |
| % Surrogate Recovery | 63 | 64 | 53 | 59 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 3. 8020 Results
(Concluded)

| Sample ID#: | 810802[3] | 810800[4] | Detection Limit |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Benzene | ND | ND | 0.0002 |
| Toluene | ND | ND | 0.0002 |
| Ethylbenzene | ND | ND | 0.0002 |
| Chlorobenzene[1] | ND | ND | 0.0002 |
| Xylenes[2] | ND | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | 0.0004 |
| Analysis Date: | 12/22/85 | 12/22/85 | |
| % Surrogate Recovery | 94 | 0 | |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

3 Detection limit increased by factor of five

4 Sample was analyzed three times; no compounds were detected, however surrogate could not be recovered in any of these analyses.

Table 4. 8020 QC

| Sample ID#: | Method Blank | 810787<br>810788<br>810789<br>810790<br>Duplicate | 810803<br>Duplicate | 810791<br>810792<br>810793<br>810794<br>% Recovery<br>(Spike Level<br>0.005 µg/g) |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | 0.0003 | 0.0002 | 65 |
| Toluene | ND | 0.0003 | 0.0003 | 61 |
| Ethylbenzene | 0.0004 | 0.0008 | 0.0006 | 60 |
| Chlorobenzene[1] | ND | ND | ND | 60 |
| Xylenes[2] | ND | ND | ND | 61 |
| Dichlorobenzenes | ND | ND | ND | 53 |
| Analysis Date: | 12/23/85 | 12/23/85 | 12/24/85 | 12/23/85 |
| % Surrogate Recovery | NA* | 96 | 76 | 53 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

* Not added

Table 5. 509A Results

| Sample ID#: | 810770 | 810776 | 810777 | 810778 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Aldrin | ND | ND | ND | ND | 0.008 |
| Dieldrin | ND | ND | ND | ND | 0.02 |
| Chlordane | ND | ND | ND | ND | 0.08 |
| 4,4'-DDT | ND | ND | ND | ND | 0.02 |
| 4,4'-DDE | ND | ND | ND | ND | 0.02 |
| 4,4'-DDD | ND | ND | ND | ND | 0.02 |
| alpha-Endosulfan | ND | ND | ND | ND | 0.08 |
| beta-endosulfan | ND | ND | ND | ND | 0.02 |
| Endosulfan sulfate | ND | ND | ND | ND | 0.02 |
| Endrin | ND | ND | ND | ND | 0.02 |
| Endrin aldehyde | ND | ND | ND | ND | 0.02 |
| Heptachlor | ND | ND | ND | ND | 0.008 |
| Heptachlor epoxide | ND | ND | ND | ND | 0.008 |
| alpha-BHC | ND | ND | ND | ND | 0.008 |
| beta-BHC | ND | ND | ND | ND | 0.008 |
| delta-BHC | ND | ND | ND | ND | 0.008 |
| gamma-BHC (Lindane) | ND | ND | ND | ND | 0.008 |
| Toxaphene | ND | ND | ND | ND | 0.2 |
| Strobane | ND | ND | ND | ND | 0.2 |
| Dichloran | ND | ND | ND | ND | 0.008 |
| PCNB | ND | ND | ND | ND | 0.008 |
| Captan | ND | ND | ND | ND | 0.02 |
| Mirex | ND | ND | ND | ND | 0.02 |
| Methoxychlor | ND | ND | ND | ND | 0.08 |

ND - Not detected

Table 5. 509A Results
(Continued)

| Sample ID#: | 810754 | 810759 | 810764 | 810769 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Aldrin | ND | ND | ND | ND |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | 0.09 | 0.10 | 0.11 | 0.09 |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |

ND - Not detected

Table 5. 509A Results
(Concluded)

| Sample ID*: | 810811 | 810834 | 810775 | Detection Limit |
|---|---|---|---|---|
| Compound | Concentration μg/L | | | |
| Aldrin | ND | ND | ND | 0.05 |
| Dieldrin | ND | ND | ND | 0.10 |
| Chlordane | ND | ND | ND | 0.5 |
| 4,4'-DDT | ND | ND | ND | 0.10 |
| 4,4'-DDE | ND | ND | ND | 0.10 |
| 4,4'-DDD | ND | ND | ND | 0.10 |
| alpha-Endosulfan | ND | ND | ND | 0.05 |
| beta-endosulfan | ND | ND | ND | 0.10 |
| Endosulfan sulfate | ND | ND | ND | 0.10 |
| Endrin | ND | ND | ND | 0.02 |
| Endrin aldehyde | ND | ND | ND | 0.10 |
| Heptachlor | ND | ND | ND | 0.05 |
| Heptachlor epoxide | ND | ND | ND | 0.05 |
| alpha-BHC | ND | ND | ND | 0.05 |
| beta-BHC | ND | ND | ND | 0.05 |
| delta-BHC | ND | ND | ND | 0.05 |
| gamma-BHC (Lindane) | 0.04 | ND | ND | 0.01 |
| Toxaphene | ND | ND | ND | 1.0 |
| Strobane | ND | ND | ND | 1.0 |
| Dichloran | ND | ND | ND | 0.05 |
| PCNB | ND | ND | ND | 0.05 |
| Captan | ND | ND | ND | 0.10 |
| Mirex | ND | ND | ND | 0.10 |
| Methoxychlor | ND | ND | ND | 0.2 |

ND - Not detected

Table 6. 509A QC Results

| Sample ID#: | Soil Method Blank, μg/g | Water Method Blank, μg/L | 810754 Duplicate, μg/L |
|---|---|---|---|
| Compound | Concentration | | |
| Aldrin | ND | ND | ND |
| Dieldrin | ND | ND | ND |
| Chlordane | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND |
| alpna-Endosulfan | ND | ND | ND |
| beta-endosulfan | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND |
| Endrin | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND |
| Heptachlor | ND | ND | ND |
| Heptacnlor epoxide | ND | ND | ND |
| alpha-BHC | ND | ND | ND |
| beta-BHC | ND | ND | ND |
| delta-BHC | ND | ND | ND |
| gamma-BHC (Lindane) | ND | ND | ND |
| Toxaphene | ND | ND | 0.13 |
| Strobane | ND | ND | ND |
| Dichloran | ND | ND | ND |
| PCNB | ND | ND | ND |
| Captan | ND | ND | ND |
| Mirex | ND | ND | ND |
| Methoxychlor | ND | ND | ND |

ND - Not detected

Table 7. 509B Results

| Sample ID#: | 810754 | 810759 | 810764 | 810769 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| 2,4-D | ND | ND | ND | ND |
| 2,4,5-T | ND | ND | ND | ND |
| Silvex | ND | ND | ND | ND |

ND - Not detected

Table 7. 509B Results

| Sample ID#: | 810811 | 810834 | 810775 | Water[1] Detection Limit |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| 2,4-D | ND | ND | ND | 10 |
| 2,4,5-T | ND | ND | ND | 5 |
| Silvex | ND | ND | ND | 5 |

ND - Not detected

[1] Interferences raised detection limit.

Table 7. 509B Results
(Continued)

| Sample ID#: | 810770 | 810776 | 810777 |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| 2,4-D | ND | ND | ND |
| 2,4,5-T | ND | ND | ND |
| Silvex | ND | ND | ND |

ND - Not detected

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UNCLASSIFIED F33615-83-D-4000 F/G 24/4 NL

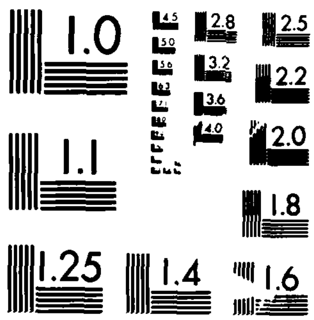


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Table 7. 509B Results
(Concluded)

| Sample ID#: | 810778 | Detection Limit[1] |
|---|---|---|
| Compound | Concentration µg/g | |
| 2,4-D | ND | 0.3 |
| 2,4,5-T | ND | 0.1 |
| Silvex | ND | 0.1 |

ND - Not detected

1 Interferences raised detection limit

Table 8. 509B QC

| Sample ID#: | Method Blank |
|---|---|
| Compound | Concentration μg/g |
| 2,4-D | ND |
| 2,4,5-T | ND |
| Silvex | ND |

ND - Not detected

Table 9. General Chemistry Results

| Sample ID | Oil and Grease, mg/L | Phenols, total, µg/L |
|---|---|---|
| 810752 | 2.2 | NA |
| 810757 | 1.8 | NA |
| 810762 | 1.4 | NA |
| 810767 | 1.3 | NA |
| 810809 | 1.4 | NA |
| 810832 | 0.4 | NA |
| 810773 | <0.1 | NA |
| 810833 | NA | 17 |
| 810810 | NA | 2 |

| Sample ID | Lead, µg/g | Oil and Grease, ug/g | Petroleum Hydrocarbons, µg/g | Phenols, total, µg/g |
|---|---|---|---|---|
| 810770 | NA | <100 | NA | <1 |
| 810776 | NA | <100 | NA | 2 |
| 810777 | NA | <100 | NA | <1 |
| 810778 | NA | <100 | NA | <1 |
| 810801 | NA | <100 | <100 | <1 |
| 810802 | NA | 700[a] | 1,400[a] | <1 |
| 810803 | NA | <100 | <100 | <1 |
| 810805 | NA | <100 | <100 | <1 |
| 810806 | NA | <100 | <100 | 1 |
| 810807 | NA | <100 | 100 | <1 |
| 810836 | 15 | <100 | <100 | 1 |
| 810800 | 25 | <100 | <100 | <1 |
| 810795 | 13 | <100 | <100 | <1 |
| 810796 | 12 | <100 | <100 | <1 |
| 810797 | 13 | <100 | <100 | <1 |
| 810798 | 11 | <100 | <100 | <1 |
| 810799 | 22 | <100 | <100 | <1 |

NA - Not analyzed
a - Sample not homogenized before analysis to preserve integrity.

Table 10. General Chemistry QC

| Sample ID | Water Oil and Grease, mg/L |
|---|---|
| Method Blank | <0.1 |
| | **Water Phenols, total, µg/L** |
| Method Blank | <1 |
| 810833 duplicate | 19 |
| | **Soil Lead, µg/g** |
| Method Blank | <1 |
| 810800 duplicate | 21 |
| 810797 spiked at 40 µg/g | 100% Recovery |
| | **Soil Oil and Grease µg/g** |
| Method Blank | <100 |
| 810776 duplicate | <100 |
| 810801 duplicate | <100 |
| 810776 spiked at 290 µg/g | 106% Recovery |
| | **Soil Petroleum Hydrocarbons, µg/g** |
| Method Blank | <100 |
| 810801 duplicate | <100 |
| | **Soil Phenols, total µg/g** |
| Method Blank | <1 |
| 810776 duplicate | 2 |
| 810777 duplicate | <1 |
| 810801 spiked at 2 µg/g | 102% Recovery |

Table 11. Eight Metals Results

Waters, µg/L

| | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| 810830 | <10 | <60 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810835 | 20 | <60 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810745 | <10 | <60 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810756 | <10 | <60 | <10 | <10 | <20 | <1 | <10 | 40 |
| 810761 | 20 | <60 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810766 | <10 | <60 | <10 | <10 | <20 | <1 | <10 | 20 |

Soils, µg/g

| | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| 810770 | 14 | 66 | 0.8 | 20 | 13 | 0.10 | <0.2 | 12 |
| 810776 | 7.0 | 44 | 0.4 | 11 | 5 | <0.05 | <0.2 | 0.6 |
| 810777 | 14 | 35 | 0.6 | 20 | 7 | <0.05 | <0.2 | 7.2 |
| 810778 | 7.3 | 59 | 0.6 | 19 | 8 | <0.05 | <0.2 | 4.0 |
| 810791-4 | 6.8 | 71 | 0.4 | 18 | 9 | <0.05 | <0.2 | 6.0 |
| 810779-82 | 13 | 89 | 0.6 | 20 | 12 | <0.05 | 0.4 | 12 |
| 810783-6 | 16 | 89 | 0.6 | 29 | 13 | <0.05 | 0.4 | 2.8 |
| 810787-90 | 12 | 82 | 0.6 | 25 | 11 | <0.05 | <0.2 | 2.8 |

Table 11. Eight Metals QC

Waters, μg/L

| | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| Method Blank | <10 | <60 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810830 duplicate | <10 | <60 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810766 spike | 91%R | 105%R | 96%R | 87%R | 92%R | 100%R | 73%R | 92%R |
| spiked level | 200 | 2,000 | 2,000 | 2,000 | 2,000 | 2 | 200 | 2,000 |

Soils, μg/g

| | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| Method Blank | <0.2 | <1 | <0.2 | <0.2 | <1 | <0.05 | <0.2 | <0.2 |
| 810770 duplicate | 14 | 69 | 0.8 | 22 | 14 | 0.15 | <0.2 | 20 |

R - Recovery

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JAN 27 1986
AeroVironment Inc.

# CHEMICAL ANALYSIS OF WATER AND SOIL SAMPLES

JANUARY 16, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

ACUREX Corporation

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

January 16, 1986
Acurex ID#: 8511-052


Attention: Chris Lovedahl

Subject: Twelve Waters and Forty-four Soils for Analysis; Received 11/25/85

Selected samples were analyzed following EPA method 8010 using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1 including recoveries of dibromomethane which was employed as a surrogatge. QC results for Method 8010 are presented in Table 2.

Selected samples were analyzed following EPA Method 8020 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through a 5 g soil sample dispersed in 5 mL of reagent grade water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

The method 8020 analyses were delayed due to the PID detector breaking and the inability of HNU to provide a replacement part. When HNU finally sent a replacement, it turned out to be defective. At that point, Acurex obtained a Varian PID which was employed in the analyses. Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 8020 are presented in Table 4.

Selected samples were analyzed for pesticides following Method 509A and herbicides following Method 509B (Standard Methods for the Examination of Water and Wastewater, 16th edition). A 3% OV-1 column was employed as the primary column for pesticides. A 30 meter DB1 fused silica column was used as the primary column for the herbicides. Samples for pesticide analysis were sonicated in 15% methylene chloride/hexane, concentrated, and then injected into a gas chromatograph operated isothermally. Detection of the eluting compounds were performed with an electron capture detector. Samples for herbicide analysis were extracted with diethyl ether and the extract hydrolyzed. The herbicide acids were methylated and then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of the pesticides and herbicides. Results of the 509A analyses are presented in Table 5 with QC results in Table 6. Results of the 509B analyses are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for oil and grease by sonicating the soil in freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for total phenols by forming a slurry of soil in water, distillation of the slurry, and finally measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for petroleum hydrocarbons by sonicating the soil in freon (EPA Method 3550), passing the extract across silica gel, and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for lead by rigorous digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for eight metals by rigorous digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 11 with QC results in Table 12.

Selected samples were analyzed for PCBs following Methods 3550 and 608. A 3% OV-1 column was employed as the primary column. Samples were sonicated in 1:1 acetone/hexane, concentrated, and then injected into a gas chromatograph operated isothermally. Detection of the eluting compounds were performed with an electron capture detector. Results of the PCB determinations are presented in Table 13 with QC results in Table 14.

Submitted by: Greg Nicoll

Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

Table 1. 8010 Results

| Sample ID#: | 810874 | 810875 | 810876 | 810880 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.001* | 0.001* | 0.001* | 0.004* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | 0.0002 | 0.0001 | 0.0002 | 0.0002 |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | 0.0006 | 0.0005 | 0.0001 | ND |
| Chloroform | ND | ND | ND | 0.00007 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | 0.00013 | ND | ND | 0.00016 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.0002 | 0.0006 | ND | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | ND | ND |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | 0.0044 | 0.0002 |
| Surrogate Recovery, % | 71 | 75 | 72 | 66 |
| Analysis Date: | 12/27/85 | 12/27/85 | 12/27/85 | 12/27/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810881 | 810826 | 810827 | 810882 |
|---|---|---|---|---|
| Compound | Concentration μg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.003* | 0.003* | 0.003* | 0.003* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | 0.0001 | ND | ND |
| Chloroform | 0.00028 | 0.00042 | 0.00042 | 0.00007 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | 0.00004 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | ND | ND |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 57 | 50 | 95 | 99 |
| Analysis Date: | 11/30/85 | 11/30/85 | 11/30/85 | 12/27/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810824 | 810825 | 810849 | 810850 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.004* | 0.003* | 0.002* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| ,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.00037 | 0.00042 | 0.00042 | 0.00039 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | ND | ND |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 76 | 80 | 94 | 76 |
| Analysis Date: | 11/30/85 | 11/30/85 | 11/30/85 | 11/30/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810852 | 810853 | 810859 | 810883 |
|---|---|---|---|---|
| Compound | Concentration μg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.003* | 0.002* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.00043 | 0.00069 | 0.00057 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | 0.00002 | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 88 | 99 | 86 | 88 |
| Analysis Date: | 11/30/85 | 11/27/85 | 11/27/85 | 11/27/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810852 | 810853 | 810859 | 810883 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.002* | 0.003* | 0.002* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.00043 | 0.00069 | 0.00057 | 0.0004 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 88 | 99 | 86 | 88 |
| Analysis Date: | 11/30/85 | 11/27/85 | 11/27/85 | 11/27/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Continued)

| Sample ID#: | 810813 | 810814 | 810815 | 810816 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.004* | 0.004* | 0.002* | 0.002* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | 0.0002 |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | 0.00048 | 0.00032 | 0.00037 | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | 0.00004 | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | 0.0006 | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 75 | 72 | 60 | 61 |
| Analysis Date: | 11/27/85 | 11/27/85 | 11/27/85 | 11/27/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 8010 Results
(Concluded)

| Sample ID#: | 810817 | 810818 | 810867 | Detection Limit |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | 0.00008 |
| Bromomethane | ND | ND | ND | 0.001 |
| Dichlorodifluoromethane | ND | ND | ND | 0.002 |
| Vinyl chloride | ND | ND | ND | 0.0002 |
| Chloroethane | ND | ND | ND | 0.0005 |
| Methylene chloride | 0.002* | 0.002* | 0.002* | 0.0002 |
| Trichlorofluoromethane | ND | ND | ND | 0.001 |
| 1,1-DCE | ND | ND | ND | 0.0001 |
| 1,1-DCA | ND | ND | ND | 0.00007 |
| trans-1,2-DCE | ND | ND | ND | 0.0001 |
| Chloroform | 0.0031 | 0.00037 | 0.00034 | 0.00005 |
| 1,2-DCA | ND | ND | ND | 0.00003 |
| 1,1,1-TCA | ND | 0.00027 | 0.00004 | 0.00003 |
| Carbon tetrachloride | ND | ND | ND | 0.0001 |
| Bromodichloromethane | ND | ND | ND | 0.0001 |
| 1,2-Dichloropropane | ND | ND | ND | 0.00004 |
| trans-1,3-Dichloropropane | ND | ND | ND | 0.0003 |
| TCE | ND | ND | ND | 0.0001 |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | 0.0002 |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | 0.0001 |
| Bromoform | ND | ND | ND | 0.0002 |
| Tetrachloroethane[b] | ND | ND | 0.0008 | 0.0003 |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | ND | 0.0003 |
| Surrogate Recovery, % | 61 | 48 | 70 | |
| Analysis Date: | 11/27/85 | 11/27/85 | 11/27/85 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 8010 QC

| Sample ID#: | Method Blank | Method Blank | Method Blank | Method Blank |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.0003 | 0.001 | 0.001 | 0.002 |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | 0.0001 | 0.0001 | 0.0002 |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | ND | 0.00014 | ND | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | NS | NS | NS | NS |
| Analysis Date: | 11/30/85 | 12/27/85 | 12/29/85 | 12/30/85 |

a - These compounds coelute
b - These compounds coelute
NS - Not spiked

Table 2. 8010 QC

| Sample ID#: | Duplicate 810882 | Duplicate 810880 | 810819 % Recovery (Spike Level 0.005 µg/g) |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Chloromethane | ND | ND | 75 |
| Bromomethane | ND | ND | 71 |
| Dichlorodifluoromethane | ND | ND | ND |
| Vinyl chloride | ND | ND | 74 |
| Chloroethane | ND | ND | 70 |
| Methylene chloride | 0.003* | 0.007* | 93 |
| Trichlorofluoromethane | ND | ND | 71 |
| 1,1-DCE | 0.0002 | 0.0002 | 72 |
| 1,1-DCA | ND | ND | 65 |
| trans-1,2-DCE | ND | ND | 59 |
| Chloroform | 0.00007 | 0.0007 | 69 |
| 1,2-DCA | ND | ND | 70 |
| 1,1,1-TCA | ND | 0.0002 | 69 |
| Carbon tetrachloride | ND | ND | 70 |
| Bromodichloromethane | ND | ND | 63 |
| 1,2-Dichloropropane | ND | ND | 66 |
| trans-1,3-Dichloropropane | ND | ND | 66 |
| TCE | ND | ND | 65 |
| Dibromochloromethane[a] | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | 65 |
| cis-1,3-Dichloropropane[a] | | | |
| Chloroethylvinyl ether | ND | ND | 71 |
| Bromoform | ND | ND | 45 |
| Tetrachloroethane[b] | ND | ND | 62 |
| Tetrachloroethene[b] | | | |
| Chlorobenzene | ND | ND | 79 |
| Dichlorobenzenes | ND | ND | 58 |
| Surrogate Recovery, % | 79 | 60 | NS |
| Analysis Date: | 11/29/85 | 11/30/85 | 12/30/85 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level
NS - Not spiked

Table 3. 8020 Results

| Sample ID#: | 810874[3] | 810875[3] | 810876[3] | 810880[3] | 810826[3] | 810827[3] |
|---|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | | |
| Benzene | ND | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | 0.21 | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND | 0.05 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND | ND |
| Analysis Date: | 12/24/85 | 12/24/85 | 12/24/85 | 12/31/85 | 12/24/85 | 12/24/85 |
| % Surrogate Recovery | 49 | 60 | 65 | 105 | 95 | 87 |

[1] Chlorobenzene and meta-xylene

[2] Ortno-xylene and para-xylene

[3] Detection limit increased by 250

Table 3. 8020 Results
(Continued)

| Sample ID#: | 810882[3] | 810881 | 810824 | 810825 | 810849 | 810850 |
|---|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | | |
| Benzene | ND | 0.0003 | ND | ND | ND | ND |
| Toluene | ND | 0.0005 | 0.0003 | ND | 0.0002 | 0.0002 |
| Ethylbenzene | ND | 0.0006 | 0.0010 | 0.0011 | 0.0011 | 0.0008 |
| Chlorobenzene[1] | ND | 0.0003 | 0.0003 | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND | ND |
| Analysis Date: | 12/24/85 | 12/24/85 | 12/23/85 | 12/23/85 | 12/23/85 | 12/23/85 |
| % Surrogate Recovery | 83 | 83 | 65 | 82 | 62 | 49 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

[3] Detection limit increased by 250

Table 3. 8020 Results
(Continued)

| Sample ID#: | 810852 | 810853 | 810859 | 810883 | 810813 | 810814 |
|---|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | | |
| Benzene | ND | ND | ND | ND | 0.0003 | ND |
| Toluene | ND | ND | ND | ND | 0.0002 | ND |
| Ethylbenzene | 0.0021 | 0.0017 | 0.0012 | 0.0005 | 0.0007 | 0.0005 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND | ND |
| Analysis Date: | 12/23/85 | 12/23/85 | 12/23/85 | 12/24/85 | 12/24/85 | 12/24/85 |
| % Surrogate Recovery | 71 | 75 | 51 | 50 | 61 | 55 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 3. 8020 Results
(Concluded)

| Sample ID#: | 810815 | 810816 | 810817 | 810818 | 810867 | Detection Limit |
|---|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | | |
| Benzene | 0.0002 | ND | ND | ND | ND | 0.0002 |
| Toluene | 0.0006 | 0.0003 | ND | ND | ND | 0.0002 |
| Ethylbenzene | 0.0007 | 0.0010 | 0.0008 | 0.0009 | 0.0006 | 0.0002 |
| Chlorobenzene[1] | 0.0004 | 0.0002 | ND | ND | ND | 0.0002 |
| Xylenes[2] | 0.0003 | ND | ND | ND | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | ND | ND | ND | 0.0004 |
| Analysis Date: | 12/24/85 | 12/24/85 | 12/24/85 | 12/24/85 | 12/24/85 | |
| % Surrogate Recovery | 54 | 57 | 51 | 40 | 45 | |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene

Table 4. 8020 QC

| Sample ID#: | Method Blank | Duplicate 810881 | Duplicate 810824 | 810824 % Recovery (Spike Level 0.005 µg/g) |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | 71 |
| Toluene | ND | 0.0004 | 0.0003 | 65 |
| Ethylbenzene | ND | 0.0004 | 0.0003 | 67 |
| Chlorobenzene[1] | ND | ND | ND | 66 |
| Xylenes[2] | ND | ND | ND | 67 |
| Dichlorobenzenes | ND | ND | ND | 60 |
| Analysis Date: | 12/24/85 | 12/24/85 | 12/24/85 | 12/24/85 |
| % Surrogate Recovery | NA* | 83 | 80 | 67 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

* Not added

Table 5. 509A Results

| Sample ID#: | 810813 | 810814 | 810815 | 810816 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Aldrin | ND | ND | ND | ND |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | ND | ND | ND | ND |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |

ND - Not detected

Table 5. 509A Results
(Concluded)

| Sample ID#: | 810817 | 810818 | 810867 | Detection Limit |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Aldrin | ND | ND | ND | 0.008 |
| Dieldrin | ND | ND | ND | 0.02 |
| Chlordane | ND | ND | ND | 0.08 |
| 4,4'-DDT | ND | ND | ND | 0.02 |
| 4,4'-DDE | ND | ND | ND | 0.02 |
| 4,4'-DDD | ND | ND | ND | 0.02 |
| alpha-Endosulfan | ND | ND | ND | 0.08 |
| beta-endosulfan | ND | ND | ND | 0.02 |
| Endosulfan sulfate | ND | ND | ND | 0.02 |
| Endrin | ND | ND | ND | 0.02 |
| Endrin aldehyde | ND | ND | ND | 0.02 |
| Heptachlor | ND | ND | ND | 0.008 |
| Heptachlor epoxide | ND | ND | ND | 0.008 |
| alpha-BHC | ND | ND | ND | 0.008 |
| beta-BHC | ND | ND | ND | 0.008 |
| delta-BHC | ND | ND | ND | 0.008 |
| gamma-BHC (Lindane) | ND | ND | ND | 0.008 |
| Toxaphene | ND | ND | ND | 0.2 |
| Strobane | ND | ND | ND | 0.2 |
| Dichloran | ND | ND | ND | 0.008 |
| PCNB | ND | ND | ND | 0.008 |
| Captan | ND | ND | ND | 0.02 |
| Mirex | ND | ND | ND | 0.02 |
| Methoxychlor | ND | ND | ND | 0.08 |

ND - Not detected

Table 6. 509A QC

| Sample ID#: | Method Blank | Duplicate 810817 | 810817 % Recovery | Spike Level |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Aldrin | ND | ND | 83 | 0.027 |
| Dieldrin | ND | ND | 79 | 0.067 |
| Chlordane | ND | ND | NS | NS |
| 4,4'-DDT | ND | ND | 90 | 0.067 |
| 4,4'-DDE | ND | ND | NS | NS |
| 4,4'-DDD | ND | ND | NS | NS |
| alpha-Endosulfan | ND | ND | NS | NS |
| beta-endosulfan | ND | ND | NS | NS |
| Endosulfan sulfate | ND | ND | NS | NS |
| Endrin | ND | ND | 92 | 0.067 |
| Endrin aldehyde | ND | ND | NS | NS |
| Heptachlor | ND | ND | 74 | 0.027 |
| Heptachlor epoxide | ND | ND | NS | NS |
| alpha-BHC | ND | ND | NS | NS |
| beta-BHC | ND | ND | NS | NS |
| delta-BHC | ND | ND | NS | NS |
| gamma-BHC (Lindane) | ND | ND | 83 | 0.027 |
| Toxaphene | ND | ND | NS | NS |
| Strobane | ND | ND | NS | NS |
| Dichloran | ND | ND | NS | NS |
| PCNB | ND | ND | NS | NS |
| Captan | ND | ND | NS | NS |
| Mirex | ND | ND | NS | NS |
| Methoxychlor | ND | ND | NS | NS |

ND - Not detected

NS - Not spiked

Table 7. 509B Results

| Sample ID#: | 810813 | 810814 | 810815 | 810816 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| 2,4-D | ND | ND | ND | ND |
| 2,4,5-T | ND | ND | ND | ND |
| Silvex | ND | ND | ND | ND |

ND - Not detected

Table 7. 509B Results
(Concluded)

| Sample ID#: | 810817 | 810818 | 810867 | Detection Limit[1] |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| 2,4-D | ND | ND | ND | 0.3 |
| 2,4,5-T | ND | ND | ND | 0.1 |
| Silvex | ND | ND | ND | 0.1 |

ND - Not detected

1 Interferences raised detection limit

Table 8. 509B QC

| Sample ID#: | Method Blank |
|---|---|
| Compound | Concentration µg/g |
| 2,4-D | ND |
| 2,4,5-T | ND |
| Silvex | ND |

ND - Not detected

Table 9. General Chemistry Results

Waters

| Sample ID | Oil and Grease, mg/L | Phenols, total, µg/L |
|---|---|---|
| 810864 | 1.1 | NA |
| 810865 | NA | <1 |
| 810872 | 2.5 | NA |
| 810873 | NA | <1 |
| 810869 | 10 | NA |
| 810870 | NA | <1 |
| 810879 | NA | <1 |
| 810878 | 5.4 | NA |

Soils

| Sample ID | Oil and Grease, µg/g | Phenols, total, µg/g |
|---|---|---|
| 810855 | <100 | NA |
| 810856 | <100 | NA |
| 810857 | <100 | NA |
| 810858 | <100 | NA |
| 810866 | <100 | NA |
| 810813 | <100 | <1 |
| 810814 | <100 | <1 |
| 810815 | <100 | <1 |
| 810816 | <100 | <1 |
| 810817 | <100 | <1 |
| 810818 | <100 | <1 |
| 810867 | <100 | <1 |

NA - Not analyzed

Table 9. General Chemistry Results

Soils

| Sample ID | Lead, µg/g | Oil and Grease, µg/g | Petroleum Hydrocarbons, µg/g | Phenols, total, µg/g |
|---|---|---|---|---|
| 810874 | NA | 1,800 | NA | <1 |
| 810875 | NA | 800 | NA | <1 |
| 810876 | NA | 2,100 | NA | <1 |
| 810880 | NA | 33,000 | NA | <1 |
| 810881 | NA | <100 | NA | <1 |
| 810826 | 27 | 200 | 100 | <1 |
| 810827 | 47 | 1,400 | 1,100 | <1 |
| 810882 | 31 | 500 | 1,300 | <1 |
| 810824 | NA | <100 | NA | <1 |
| 810825 | NA | <100 | NA | <1 |
| 810849 | NA | <100 | NA | <1 |
| 810850 | NA | <100 | NA | <1 |
| 810852 | NA | <100 | NA | <1 |
| 810853 | NA | <100 | NA | <1 |
| 810859 | NA | <100 | NA | <1 |
| 810883 | NA | <100 | NA | <1 |
| 810819 | NA | <100 | NA | NA |
| 810820 | NA | 38,000 | NA | NA |
| 810821 | NA | 1,900 | NA | NA |
| 810822 | NA | <100 | NA | NA |
| 810823 | NA | <100 | NA | NA |
| 810848 | NA | <100 | NA | NA |
| 810851 | NA | <100 | NA | NA |
| 810854 | NA | <100 | NA | NA |

NA - Not analyzed

Table 10. General Chemistry QC

## Waters

| Sample ID | Oil and Grease, mg/L |
|---|---|
| Method Blank | <0.1 |

| | Phenols, total, µg/L |
|---|---|
| Method Blank | <1 |
| 810879 duplicate | 2 |

## Soils

| | Lead µg/g |
|---|---|
| Method Blank | <1 |

| | Oil and Grease µg/g |
|---|---|
| Method Blank | <100 |
| 810827 duplicate | 1,000 |
| 810882 duplicate | 1,300 |
| 810880 duplicate | 19,000 |
| 810850 duplicate | <100 |
| 810825 spiked at 290 µg/g | 100% |
| 810822 spiked at 290 µg/g | 97% |

| | Petroleum Hydrocarbons, µg/g |
|---|---|
| Method Blank | <100 |

| | Phenols, total, µg/g |
|---|---|
| Method blank | <1 |
| 810813 duplicate | <1 |
| 810817 duplicate | <1 |
| 810815 spiked at 2 µg/g | 74% Recovery |
| 810818 spiked at 2 µg/g | 100% Recovery |

Table 11. Eight Metals Results

Waters

Concentration, ug/L

| | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| 810828 | <10 | <60 | <10 | <10 | <10 | <1 | <10 | <30 |
| 810829 | 10 | <60 | <10 | <10 | <10 | <1 | <10 | <10 |
| 810868 | 30 | 270 | <10 | 30 | 180 | <1 | <10 | <10 |
| 810877 | <10 | 170 | <10 | 20 | 100 | <1 | <10 | <10 |

Soils

Concentration, ug/g

| | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| 810874 | 4.2 | 54 | 2.2 | 20 | 30 | <0.05 | <0.2 | <0.2 |
| 810875 | 3.8 | 51 | 0.8 | 20 | 37 | <0.05 | <0.2 | <0.2 |
| 810876 | 6.1 | 66 | 8.0 | 21 | 44 | <0.05 | <0.2 | <0.2 |
| 810880 | 9.6 | 140 | 7.0 | 82 | 410 | <0.05 | <0.2 | 0.6 |
| 810881 | 4.7 | 99 | <0.2 | 16 | 5 | <0.05 | <0.2 | <0.2 |
| 810860-2 | 24 | 1,500 | 6.8 | 2,000 | 14,000 | <0.05 | <0.2 | 0.5 |

Table 11. Eight Metals QC

Waters

Concentration µg/L

| | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| Method Blank | <10 | <60 | <10 | <10 | <10 | <1 | <10 | <10 |

Soils

Concentration µg/g

| | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| Method Blank | <0.2 | <1 | <0.2 | <0.2 | <1 | <0.05 | <0.2 | <0.2 |
| 810875 duplicate | 4.1 | 65 | 0.8 | 18 | 33 | <0.05 | <0.2 | <0.2 |
| 810881 spike | 94%R | 132%R | 98%R | 92%R | 101%R | 100%R | 92%R | 73%R |
| Spike Level | 5.0 | 40 | 2.0 | 40 | 40 | 0.20 | 4.0 | 40 |

R - Recovery

Table 13. PCB Results

| Sample ID#: | 810819 | 810820 | 810821 | 810822 | 810823 | 810848 | 810851* |
|---|---|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | | | |
| Aroclor 1016 | ND | ND | ND | ND | ND | ND | ND |
| Aroclor 1221 | ND | ND | ND | ND | ND | ND | ND |
| Aroclor 1232 | ND | ND | ND | ND | ND | ND | ND |
| Aroclor 1242 | ND | ND | ND | ND | ND | ND | ND |
| Aroclor 1248 | ND | ND | ND | ND | ND | ND | ND |
| Aroclor 1254 | ND | ND | ND | ND | ND | ND | ND |
| Aroclor 1260 | ND | 5.3 | ND | ND | ND | ND | ND |

* Detection Limit is 0.2 µg/g

Table 13. PCB Results

(Concluded)

| Sample ID#: | 810854 | 810855 | 810856 | 810857 | 810858 | 810866 | Detection Limit |
|---|---|---|---|---|---|---|---|
| Compound | Concentration ug/g | | | | | | |
| Aroclor 1016 | ND | ND | ND | ND | ND | ND | 0.08 |
| Aroclor 1221 | ND | ND | ND | ND | ND | ND | 0.08 |
| Aroclor 1232 | ND | ND | ND | ND | ND | ND | 0.08 |
| Aroclor 1242 | ND | ND | ND | ND | ND | ND | 0.08 |
| Aroclor 1248 | ND | ND | ND | ND | ND | ND | 0.08 |
| Aroclor 1254 | ND | ND | ND | ND | ND | ND | 0.08 |
| Aroclor 1260 | ND | ND | ND | ND | ND | ND | 0.08 |

Table 14. PCB QC Results

| Sample ID#: | Method Blank | 810820 Duplicate | 810822 Spike % Recovery | 810854 Duplicate | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | |
| Aroclor 1016 | ND | ND | NS | ND | 0.08 |
| Aroclor 1221 | ND | ND | NS | ND | 0.08 |
| Aroclor 1232 | ND | ND | NS | ND | 0.08 |
| Aroclor 1242 | ND | ND | NS | ND | 0.08 |
| Aroclor 1248 | ND | ND | NS | ND | 0.08 |
| Aroclor 1254 | ND | ND | 89* | ND | 0.08 |
| Aroclor 1260 | ND | 7.4 | NS | ND | 0.08 |

NS - Not spiked

* Spiked at 5 µg per 30g of sample

RECEIVED
FEB 1? 1986
AeroVironment Inc.

# CHEMICAL ANALYSIS OF WATER SAMPLES

FEBRUARY 4, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACURE X CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX
Corporation

**ACUREX Corporation**

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

February 4, 1986
Acurex ID#: 8601-006


Attention: Chris Lovedahl

Subject: Thirteen Waters for Analysis; Received 1/7/86

Selected samples were analyzed following EPA Method 601 for waters using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1 including recoveries of dibromethane which was employed as a surrogate. QC results for Method 601 are presented in Table 2.

Selected samples were analyzed following EPA Method 602 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 602 are presented in Table 4.

Selected samples were analyzed for oil and grease by extracting the water with freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 5 with QC results in Table 6.

Selected samples were analyzed for petroleum hydrocarbons by extracting the water in freon (EPA Method 3550), passing the extract across silica gel, and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 5 with QC results in Table 6.

Selected samples were analyzed for total phenols by distillation and measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for eight metals by rigorous digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 9 with QC results in Table 10.

Submitted by: ______________________________ Greg Nicoll, Manager, Inorganic Chemistry

______________________________ Viorica Lopez-Avila, Ph.D., Technical Director

GN/VLA/ats

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. 601 Results

| Sample ID#: | 810884 | 810888 | 810896 | 810899 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration μg/L | | | | |
| Chloromethane | ND | ND | ND | ND | 0.08 |
| Bromomethane | ND | ND | ND | ND | 1 |
| Dichlorodifluoromethane | ND | ND | ND | ND | 2 |
| Vinyl chloride | ND | ND | ND | ND | 0.2 |
| Chloroethane | ND | ND | ND | ND | 0.5 |
| Methylene chloride | 0.9* | 0.6* | 0.6* | 0.5* | 0.2 |
| Trichlorofluoromethane | ND | ND | ND | ND | 1 |
| 1,1-DCE | ND | ND | ND | ND | 0.1 |
| 1,1-DCA | ND | ND | ND | ND | 0.07 |
| trans-1,2-DCE | ND | ND | ND | ND | 0.1 |
| Chloroform | ND | ND | ND | ND | 0.05 |
| 1,2-DCA | ND | ND | ND | ND | 0.03 |
| 1,1,1-TCA | 0.08 | ND | ND | ND | 0.03 |
| Carbon tetrachloride | ND | ND | ND | ND | 0.1 |
| Bromodichloromethane | ND | ND | ND | ND | 0.1 |
| 1,2-Dichloropropane | ND | ND | ND | ND | 0.04 |
| trans-1,3-Dichloropropane | ND | ND | ND | ND | 0.3 |
| TCE | 0.2 | 0.4 | 0.3 | 0.2 | 0.1 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND | 0.2 |
| Chloroethylvinyl ether | ND | ND | ND | ND | 0.1 |
| Bromoform | ND | ND | ND | ND | 0.2 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND | 0.3 |
| Chlorobenzene | ND | ND | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | ND | ND | 0.3 |
| Surrogate Recovery, % | 106 | 94 | 87 | 85 | |
| Analysis Date: | 1/9/86 | 1/8/86 | 1/8/86 | 1/8/86 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 601 QC

| Sample ID#: | Method Blank | Method Blank | Storage Blank | 810884 Duplicate |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.8 | 1.2 | 1.1 | 1.0* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | 0.37 | 0.18 | ND | 0.69 |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 0.3 | ND | ND | 0.2 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 100 | 100 | 106 | 106 |
| Analysis Date: | 1/8/86 | 1/9/86 | 1/9/86 | 1/9/86 |

a - These compounds coelute
b - These compounds coelute
c - Units are µg/L
* - Below normal laboratory background level
NS - Not spiked

Table 3. 602 Results

| Sample ID#: | 810884 | 810888 | 810896 | 810899 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | 0.2 |
| Toluene | 3.0 | 16[3] | 2.4 | ND | 0.2 |
| Ethylbenzene | 1.4 | 0.9 | 1.7 | 1.1 | 0.2 |
| Chlorobenzene[1] | ND | ND | ND | ND | 0.2 |
| Xylenes[2] | ND | ND | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | ND | ND | 0.4 |
| Analysis Date: | 1/8/86 | 1/8/86 | 1/8/86 | 1/8/86 | |
| % Surrogate Recovery | 104 | 115 | 116 | 149 | |

1 Chlorobenzene and meta-xylene
2 Ortho-xylene and para-xylene
3 Confirmed by GC/MS Method 624

Table 4. 602 QC

| Sample ID#: | Method Blank | Storage Blank | 810884 Duplicate |
|---|---|---|---|
| Compound | Concentration ug/L | | |
| Benzene | ND | ND | ND |
| Toluene | 0.5 | ND | 2.8 |
| Ethylbenzene | 2.0 | 0.6 | 1.5 |
| Chlorobenzene[1] | ND | ND | ND |
| Xylenes[2] | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND |
| Analysis Date: | 1/8/86 | 1/8/86 | 1/8/86 |
| % Surrogate Recovery | NA | 126 | 104 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

NA - Not added

Table 5. Oil & Grease/petroleum Hydrocarbons Results

| Sample ID | Oil & Grease, mg/L | Petroleum Hydrocarbons, mg/L |
|---|---|---|
| 810886 | 0.8 | NA |
| 810889 | 3.3 | NA |
| 810897 | 2.0 | 0.9 |
| 810900 | 1.5 | NA |

NA- Not analyzed

Table 6. Oil & Grease/Petroleum Hydrocarbons QC

| Sample ID | Oil & Grease, mg/L | Petroleum Hydrocarbons, mg/L |
|---|---|---|
| Method Blank | 0.2 | <0.1 |

Table 7. Phenols Results

| Sample ID | Total Phenols, ug/L |
|---|---|
| 310887 | <1 |
| 810890 | <1 |
| 810895 | <1 |
| 810901 | <1 |

Table 8. Phenol QC

| Sample ID | Total Phenols, µg/L |
|---|---|
| Method Blank | <1 |
| 810901 duplicate | <1 |
| 810887 spiked at 100 µg/L | 94% Recovery |

Table 9. Eight Metals Results

Waters, ug/L

| Sample ID: | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| 810885 | <10 | 6[illegible] | <10 | <10 | <20 | <1 | <10 | <10 |

Table 10. Eight Metals QC

Waters, µg/L

| Sample ID: | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| Method Blank | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |

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# CHEMICAL ANALYSIS OF WATER SAMPLES

FEBRUARY 7, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

**ACUREX Corporation**

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

February 7, 1986
Acurex ID#: 8601-009


Attention: Chris Lovedahl

Subject: Twenty-three Waters for Analysis;
Received 1/08/86

Selected samples were analyzed following EPA Method 601 for waters using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1 including recoveries of dibromethane which was employed as a surrogate. QC results for Method 601 are presented in Table 2.

Selected samples were analyzed following EPA Method 602 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 602 are presented in Table 4.

555 Clyde Avenue PO Box 7555 Mountain View CA 94039 (415) 964-3200 Telex 34-6391 TWX 910-7796593

Two water samples were analyzed for semivolatile organics according to U.S. EPA Method 625 (Federal Register, Volume 49 #209, Oct. 26, 1984; Page 153). Results are presented in Table 5. The method can be summarized as follows:

> One liter of sample is serially extracted with methylene chloride at a pH greater than 11 and again at pH less than 2. The two methylene chloride extracts are dried and each concentrated to a volume of 1 mL. The concentrate is injected into GC/MS systems set specifically for the separation and measurement of the priority pollutants. Qualitative identification of the priority pollutants is performed initially using the relative retention times, the relative abundance of three characteristic ions and their ratios. The entire mass spectrum is reviewed before an identification is recorded. Quantitative analysis is performed using an internal standard with a single characteristic ion.

Prior to analysis every sample is spiked with surrogate compounds as part of Acurex's Quality Control Program. These compounds simulate the behavior of compounds of interest and confirm that acceptable recoveries are being achieved on every sample. The results of surrogate recoveries are reported with the sample results. The method blank is reported in Table 6.

Selected samples were analyzed for oil and grease by extracting water with freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for petroleum hydrocarbons by extracting the water in freon (EPA Method 3550), passing the extract across silica gel, and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for total phenols by distillation and measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for lead by digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 11 with QC results in Table 12.

Selected samples were analyzed for eight metals by digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 13 with QC results in Table 14.

Submitted by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila
Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. 601 Results

| Sample ID#: | 810288 | 810296 | 810298 | 810302 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.6* | 0.8* | 1.8* | 0.8* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | 0.66 | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 88 | 78 | 103 | 113 |
| Analysis Date: | 1/9/86 | 1/9/86 | 1/9/86 | 1/9/86 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 601 Results
(Concluded)

| Sample ID#: | 810891 | 810894 | Detection Limit |
|---|---|---|---|
| Compound | Concentration ug/L | | |
| Chloromethane | ND | ND | 0.08 |
| Bromomethane | ND | ND | 1 |
| Dichlorodifluoromethane | ND | ND | 2 |
| Vinyl chloride | ND | ND | 0.2 |
| Chloroethane | ND | ND | 0.5 |
| Methylene chloride | 0.9* | 0.8* | 0.2 |
| Trichlorofluoromethane | ND | ND | 1 |
| 1,1-DCE | ND | ND | 0.1 |
| 1,1-DCA | ND | ND | 0.07 |
| trans-1,2-DCE | ND | ND | 0.1 |
| Chloroform | ND | ND | 0.05 |
| 1,2-DCA | ND | ND | 0.03 |
| 1,1,1-TCA | ND | ND | 0.03 |
| Carbon tetrachloride | ND | ND | 0.1 |
| Bromodichloromethane | ND | ND | 0.1 |
| 1,2-Dichloropropane | ND | ND | 0.04 |
| trans-1,3-Dichloropropane | ND | ND | 0.3 |
| TCE | ND | ND | 0.1 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | 0.2 |
| Chloroethylvinyl ether | ND | ND | 0.1 |
| Bromoform | ND | ND | 0.2 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | 0.3 |
| Chlorobenzene | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | 0.3 |
| Surrogate Recovery, % | 116 | 102 | |
| Analysis Date: | 1/9/86 | 1/9/86 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 601 QC

| Sample ID#: | Method Blank | Method Blank | 810894 Duplicate |
|---|---|---|---|
| Compound | Concentration µg/L | | |
| Chloromethane | ND | ND | ND |
| Bromomethane | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND |
| Vinyl chloride | ND | ND | ND |
| Chloroethane | ND | ND | ND |
| Methylene chloride | 1.2 | 3.9 | 6.2* |
| Trichlorofluoromethane | ND | ND | ND |
| 1,1-DCE | ND | ND | ND |
| 1,1-DCA | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND |
| Chloroform | ND | ND | ND |
| 1,2-DCA | ND | ND | ND |
| 1,1,1-TCA | 0.18 | 0.13 | 0.11 |
| Carbon tetrachloride | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND |
| TCE | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND |
| Bromoform | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND |
| Chlorobenzene | ND | ND | 0.3 |
| Dichlorobenzenes | ND | ND | ND |
| Surrogate Recovery, % | 100 | 100 | 101 |
| Analysis Date: | 1/9/86 | 1/10/86 | 1/10/86 |

a - These compounds coelute
b - These compounds coelute
c - Units are µg/L
* - Below normal laboratory background level
NS - Not spiked

Table 3. 602 Results

| Sample ID#: | 810288 | 810296 | 810298 | 810302 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Benzene | ND | ND | ND | 0.4 |
| Toluene | 0.3 | 0.7 | 0.5 | 0.6 |
| Ethylbenzene | 0.6 | 0.7 | 0.9 | 0.8 |
| Chlorobenzene[1] | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 1/8/86 | 1/8/86 | 1/8/86 | 1/8/86 |
| % Surrogate Recovery | 154 | 162 | 154 | 160 |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

Table 3. 602 Results
(Concluded)

| Sample ID#: | 810891 | 810894 | Detection Limit |
|---|---|---|---|
| Compound | Concentration µg/L | | |
| Benzene | 0.2 | ND[3] | 0.2 |
| Toluene | 2.6 | 0.8 | 0.2 |
| Ethylbenzene | 0.5 | 0.3 | 0.2 |
| Chlorobenzene[1] | 0.2 | ND | 0.2 |
| Xylenes[2] | ND | ND | 0.2 |
| Dichlorobenzenes | 0.4 | 0.4 | 0.4 |
| Analysis Date: | 1/10/86 | 1/10/86 | |
| % Surrogate Recovery | 100 | 101 | |

1 Chlorobenzene and meta-xylene
2 Ortho-xylene and para-xylene
3 Not confirmed by GC/MS using EPA Method 624 (GC gave value of 1.0 µg/L)

Table 4. 602 QC

| Sample ID#: | Method Blank | Method Blank | 810891 Duplicate |
|---|---|---|---|
| Compound | Concentration µg/L | | |
| Benzene | ND | ND | 0.2 |
| Toluene | 0.5 | 0.4 | 2.4 |
| Ethylbenzene | 2.0 | 0.9 | 0.4 |
| Chlorobenzene[1] | ND | 0.2 | ND |
| Xylenes[2] | ND | ND | ND |
| Dichlorobenzenes | ND | ND | 0.4 |
| Analysis Date: | 1/8/86 | 1/10/86 | 1/10/86 |
| % Surrogate Recovery | NA | NA | 106 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

NA - Not added

Table 5. 625 Results

| Sample ID#: | 810286 | 810294 |
| --- | --- | --- |
| **Priority Pollutants** | **Concentration (µg/L)** | |
| Phenol | ND | 2 |
| Bis(2-ethylhexyl)phthalate | 7* | 3* |
| All Other Priority Pollutants | ND | ND |
| Detection Limit | 2 | 2 |
| **Surrogate Recoveries** | **Percent (%)** | |
| 2-Fluorophenol | 72 | 80 |
| Phenol-$d_5$ | 66 | 74 |
| Nitrobenzene-$d_5$ | 70 | 73 |
| 2-Fluorobiphenyl | 70 | 78 |
| 2,4,6-Tribromophenol | 104 | 98 |
| Terphenyl-$d_{14}$ | 74 | 72 |

ND - Not Detected

* At normal background levels

Table 6. 625 QC

| Sample ID#: | Method Blank |
|---|---|
| **Priority Pollutants** | **Concentration (ug/L)** |
| All | ND |
| Detection Limit | 2 |
| **Surrogate Recoveries** | **Percent (%)** |
| 2-Fluorophenol | 88 |
| Phenol-$d_5$ | 74 |
| Nitrobenzene-$d_5$ | 68 |
| 2-Fluorobiphenyl | 68 |
| 2,4,6-Tribromophenol | 104 |
| Terphenyl-$d_{14}$ | 84 |

ND - Not Detected

Table 7. Oil & Grease/Petroleum Hydrocarbons Results

| Sample ID | Oil & Grease, mg/L | Petroleum Hydrocarbons, mg/L |
|---|---|---|
| 810289 | 2.3 | 1.4 |
| 810297 | 0.8 | NA |
| 810299 | 0.6 | 0.5 |
| 810303 | 0.5 | NA |
| 810892 | 0.6 | 0.4 |
| 810895 | 0.8 | 0.8 |

NA- Not analyzed

Table 8. Oil & Grease/Petroleum Hydrocarbons QC

| Sample ID | Oil & Grease, mg/L | Petroleum Hydrocarbons, mg/L |
|---|---|---|
| Method Blank | 0.2 | <0.1 |

Table 9. Total Phenols Results

| Sample ID | Total Phenols, ug/L |
|---|---|
| 810291 | 1 |
| 810293 | <1 |
| 810300 | <1 |
| 810893 | <1 |

Table 10. Total Phenols QC

| Sample ID | Total Phenols, μg/L |
|---|---|
| Method Blank | <1 |
| S10893 duplicate | <1 |
| 810291 spiked at 100 μg/L | 94% Recovery |

Table 11. Lead Results

| Sample ID | Lead, ug/L |
|---|---|
| 810290 | <20 |
| 810292 | <20 |
| 810301 | <20 |

Table 12. Lead QC

| Sample ID | Lead, µg/L |
|---|---|
| Metnod Blank | <20 |

Table 13. Eight Metals Results

Waters, µg/L

| Sample ID | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| 810287 | <10 | 60 | <10 | <10 | <20 | <1 | <10 | 30 |
| 810295 | <10 | 160 | <10 | <10 | <20 | <1 | <10 | <10 |

Table 14. Eight Metals QC

Waters, ug/L

| Sample ID | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| Metnod Blank | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |

C416K

# CHEMICAL ANALYSIS OF WATER SAMPLES

FEBRUARY 10, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

**ACUREX Corporation**

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

February 10, 1986
Acurex ID#: 8601-013


Attention: Chris Lovedahl

Subject: Fifty-two Waters for Analysis; Received 1/9/86

Selected samples were analyzed following EPA Method 601 for waters using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1 including recoveries of dibromethane which was employed as a surrogate. QC results for Method 601 are presented in Table 2.

Selected samples were analyzed following EPA Method 602 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 602 are presented in Table 4.

Two water samples were analyzed for semivolatile organics according to U.S. EPA Method 625 (Federal Register, Volume 49 #209, Oct. 26, 1984; Page 153). Results are presented in Table 5. The method can be summarized as follows:

> One liter of sample is serially extracted with methylene chloride at a pH greater than 11 and again at pH less than 2. The two methylene chloride extracts are dried and each concentrated to a volume of 1 mL. The concentrate is injected into GC/MS systems set specifically for the separation and measurement of the priority pollutants. Qualitative identification of the priority pollutants is performed initially using the relative retention times, the relative abundance of three characteristic ions and their ratios. The entire mass spectrum is reviewed before an identification is recorded. Quantitative analysis is performed using an internal standard with a single characteristic ion.

Prior to analysis every sample is spiked with surrogate compounds as part of Acurex's Quality Control Program. These compounds simulate the behavior of compounds of interest and confirm that acceptable recoveries are being achieved on every sample. The results of surrogate recoveries are reported with the sample results. The method blank is reported in Table 6.

Selected samples were analyzed for oil and grease by extracting water with freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for petroleum hydrocarbons by extracting the water in freon (EPA Method 3550), passing the extract across silica gel, and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for total phenols by distillation and measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 9 with QC results in Table 10.

Selected samples were analyzed for lead by digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 11 with QC results in Table 12.

Selected samples were analyzed for eight metals by digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 13 with QC results in Table 14.

Submitted by: Greg Nicoll

Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

Table 1. 601 Results

| Sample ID#: | 810400 | 810404 | 810408 | 810416 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.8* | 3.9* | 4.0* | 2.7* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | 0.2 |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | ND | ND |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | 0.4 | 0.4 | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 108 | 94 | 112 | 86 |
| Analysis Date: | 1/9/86 | 1/10/86 | 1/10/86 | 1/10/86 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 601 Results
(Continued)

| Sample ID#: | 810421 | 810438 | 810442 | 810446 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 1.6* | 1.0* | 0.6* | 1.7* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 118 | 101 | 54 | 75 |
| Analysis Date: | 1/10/86 | 1/11/86 | 1/11/86 | 1/13/86 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 601 Results
(Concluded)

| Sample ID#: | 810450 | 810454 | 810478 | 810482 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration ug/L | | | | |
| Chloromethane | ND | ND | ND | ND | 0.08 |
| Bromomethane | ND | ND | ND | ND | 1 |
| Dichlorodifluoromethane | ND | ND | ND | ND | 2 |
| Vinyl chloride | ND | ND | ND | ND | 0.2 |
| Chloroethane | ND | ND | ND | ND | 0.5 |
| Methylene chloride | 1.0* | 0.9* | 0.9* | 0.9* | 0.2 |
| Trichlorofluoromethane | ND | ND | ND | ND | 1 |
| 1,1-DCE | ND | ND | ND | ND | 0.1 |
| 1,1-DCA | ND | ND | ND | ND | 0.07 |
| trans-1,2-DCE | ND | ND | ND | ND | 0.1 |
| Chloroform | ND | ND | ND | ND | 0.05 |
| 1,2-DCA | ND | ND | ND | ND | 0.03 |
| 1,1,1-TCA | ND | ND | ND | ND | 0.03 |
| Carbon tetrachloride | ND | ND | ND | ND | 0.1 |
| Bromodichloromethane | ND | ND | ND | ND | 0.1 |
| 1,2-Dichloropropane | ND | ND | ND | ND | 0.04 |
| trans-1,3-Dichloropropane | ND | ND | ND | ND | 0.3 |
| TCE | ND | ND | ND | ND | 0.1 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND | 0.2 |
| Chloroethylvinyl ether | ND | ND | ND | ND | 0.1 |
| Bromoform | ND | ND | ND | ND | 0.2 |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND | 0.3 |
| Chlorobenzene | ND | ND | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | ND | ND | 0.3 |
| Surrogate Recovery, % | 114 | 129 | 136 | 119 | |
| Analysis Date: | 1/11/86 | 1/11/86 | 1/11/86 | 1/11/86 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 601 QC

| Sample ID#: | Method Blank | Method Blank | Method Blank |
|---|---|---|---|
| Compound | Concentration µg/L | | |
| Chloromethane | ND | ND | ND |
| Bromomethane | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND |
| Vinyl chloride | ND | ND | ND |
| Chloroethane | ND | ND | ND |
| Methylene chloride | 1.2 | 1.0 | 1.7 |
| Trichlorofluoromethane | ND | ND | ND |
| 1,1-DCE | ND | ND | ND |
| 1,1-DCA | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND |
| Chloroform | ND | ND | ND |
| 1,2-DCA | ND | ND | ND |
| 1,1,1-TCA | 0.18 | ND | ND |
| Carbon tetrachloride | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND |
| TCE | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND |
| Bromoform | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND |
| Chlorobenzene | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND |
| Surrogate Recovery, % | 100 | 100 | 100 |
| Analysis Date: | 1/9/86 | 1/11/86 | 1/13/86 |

a - These compounds coelute
b - These compounds coelute

Table 2. 601 QC
(Concluded)

| Sample ID#: | Storage Blank | Duplicate 310442 | 810404 % Recovery (Spike Level 5 ug/L) |
|---|---|---|---|
| Compound | Concentration ug/L | | |
| Chloromethane | ND | ND | 99 |
| Bromomethane | ND | ND | 99 |
| Dichlorodifluoromethane | ND | ND | NS |
| Vinyl chloride | ND | ND | 102 |
| Chloroethane | ND | ND | 100 |
| Methylene chloride | 1.4 | 0.8* | 98 |
| Trichlorofluoromethane | ND | ND | 99 |
| 1,1-DCE | ND | ND | 99 |
| 1,1-DCA | ND | ND | 102 |
| trans-1,2-DCE | ND | ND | 102 |
| Chloroform | ND | ND | 102 |
| 1,2-DCA | ND | ND | 93 |
| 1,1,1-TCA | ND | ND | 106 |
| Carbon tetrachloride | ND | ND | 102 |
| Bromodichloromethane | ND | ND | 99 |
| 1,2-Dichloropropane | ND | ND | 99 |
| trans-1,3-Dichloropropane | ND | ND | 100 |
| TCE | ND | ND | 109 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | 96 |
| Chloroethylvinyl ether | ND | ND | 92 |
| Bromoform | ND | ND | 89 |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | 96 |
| Chlorobenzene | ND | ND | 98 |
| Dichlorobenzenes | ND | ND | 101 |
| Surrogate Recovery, % | 102 | 117 | NS |
| Analysis Date: | 1/13/86 | 1/11/86 | 1/11/86 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level
NS - Not spiked

Table 3. 602 Results

| Sample ID#: | 810400 | 810404 | 810408 | 810416 | 810421 |
| --- | --- | --- | --- | --- | --- |
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | 0.9[3] | ND | ND |
| Toluene | 0.2 | 0.3 | 0.3 | 2.0 | ND |
| Ethylbenzene | 0.3 | 0.4 | 0.8 | 0.6 | 0.6 |
| Chlorobenzene[1] | ND | ND | 0.4 | ND | ND |
| Xylenes[2] | ND | ND | 0.4 | ND | ND |
| Dichlorobenzenes | ND | ND | 1.8 | ND | ND |
| Analysis Date: | 1/10/86 | 1/10/86 | 1/11/86 | 1/11/86 | 1/11/86 |
| % Surrogate Recovery | 100 | 98 | 118 | 106 | 98 |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

3 Confirmed by GC/MS using EPA Method 624

Table 3. 602 Results
(Continued)

| Sample ID#: | 810438 | 810442 | 810446 | 810450 | 810454 |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | 0.6 | 0.6 | 0.5 | 0.4 | 0.4 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | 0.5 | ND | ND | ND |
| Analysis Date: | 1/11/86 | 1/11/86 | 1/11/86 | 1/11/86 | 1/11/86 |
| % Surrogate Recovery | 104 | 102 | 103 | 103 | 99 |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene

Table 3. 602 Results
(Concluded)

| Sample ID#: | 810478 | 810482 | Detection Limit |
|---|---|---|---|
| Compound | Concentration µg/L | | |
| Benzene | ND | ND | 0.2 |
| Toluene | 0.2 | ND | 0.2 |
| Ethylbenzene | 0.9 | 1.1 | 0.2 |
| Chlorobenzene[1] | ND | ND | 0.2 |
| Xylenes[2] | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | 0.4 |
| Analysis Date: | 1/13/86 | 1/13/86 | |
| Surrogate Recovery | 103 | 105 | |

... benzene and meta-xylene
... and para-xylene

Table 4. 602 QC

| Sample ID#: | Method Blank | Method Blank | Method Blank | Storage Blank | 810454 Duplicate | 810400 % Recovery (Spike Level 5 µg/L) |
|---|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | | |
| Benzene | ND | ND | ND | ND | ND | 113 |
| Toluene | 0.4 | ND | 0.3 | ND | ND | 113 |
| Ethylbenzene | 0.9 | 1.1 | 1.0 | 1.3 | 0.4 | 97 |
| Chlorobenzene[1] | 0.2 | ND | ND | ND | ND | 108 |
| Xylenes[2] | ND | ND | ND | ND | ND | 108 |
| Dichlorobenzenes | ND | ND | ND | ND | ND | 105 |
| Analysis Date: | 1/10/86 | 1/11/86 | 1/13/86 | 1/13/86 | 1/11/86 | 1/11/86 |
| % Surrogate Recovery | NA | NA | NA | 97 | 101 | 110 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

NA - Not added

Table 5. 625 Results

| Sample ID#: | 810406 | 810410 |
|---|---|---|
| **Priority Pollutants** | **Concentration (µg/L)** | |
| Phenol | ND | 3 |
| Bis(2-ethylhexyl)phthalate | 15* | 7* |
| All Other Priority Pollutants | ND | ND |
| Detection Limit | 2 | 2 |
| **Surrogate Recoveries** | **Percent (%)** | |
| 2-Fluorophenol | 66 | 40 |
| Phenol-$d_5$ | 62 | 10 |
| Nitrobenzene-$d_5$ | 74 | 68 |
| 2-Fluorobiphenyl | 74 | 72 |
| 2,4,6-Tribromophenol | 64 | 58 |
| Terphenyl-$d_{14}$ | 88 | 100 |

ND - Not Detected

* At normal background levels

Table 6. 625 QC

| Sample ID#: | Method Blank |
|---|---|
| **Priority Pollutants** | **Concentration (μg/L)** |
| Benzyl butyl phthalate | 2 |
| All Other Priority Pollutants | ND |
| Detection Limit | 2 |
| **Surrogate Recoveries** | **Percent (%)** |
| 2-Fluorophenol | 64 |
| Phenol-$d_5$ | 64 |
| Nitrobenzene-$d_5$ | 72 |
| 2-Fluorobiphenyl | 66 |
| 2,4,6-Tribromophenol | 85 |
| Terphenyl-$d_{14}$ | 110 |

ND - Not Detected

Table 7. Oil & Grease/Petroleum Hydrocarbons Results

| Sample ID | Oil & Grease, mg/L | Petroleum Hydrocarbons, mg/L |
|---|---|---|
| 810401 | 2.2 | 1.8 |
| 810405 | 1.8 | NA |
| 810409 | 0.9 | NA |
| 810417 | 0.7 | NA |
| 810420 | 0.9 | NA |
| 810439 | 0.4 | NA |
| 810443 | 0.4 | NA |
| 810447 | 0.2 | NA |
| 810451 | 0.4 | NA |
| 810455 | 0.8 | NA |
| 810479 | 0.4 | NA |
| 810483 | 0.2 | NA |

NA - Not analyzed

Table 8. Oil & Grease/Petroleum Hydrocarbons QC

| Sample ID | Oil & Grease, mg/L | Petroleum Hydrocarbons, mg/L |
|---|---|---|
| Method Blank | 0.2 | 0.2 |

Table 9. Total Phenols Results

| Sample ID | Total Phenols, µg/L |
|---|---|
| 810403 | 18 |
| 810412 | 28 |
| 810413 | 100 |
| 810414 | 37 |
| 810415 | 35 |
| 810419 | 33 |
| 810422 | 30 |
| 810437 | 34 |
| 810441 | 33 |
| 810445 | 46 |
| 810449 | 5 |
| 810453 | 9 |
| 810457 | 80 |
| 810481 | 40 |

Table 10. Total Phenols QC

| Sample ID | Total Phenols, µg/L |
|---|---|
| Method Blank | 4 |
| 810412 duplicate | 31 |
| 810449 spiked at 100 µg/L | 92% Recovery |

Table 11. Lead Results

| Sample ID | Lead, ug/L |
|---|---|
| 810402 | <20 |

Table 12. Lead QC

| Sample ID | Lead, µg/L |
|---|---|
| Method Blank | <20 |

Table 13. Eight Metals Results

Waters, µg/L

| Sample ID | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| 810407 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810411 | <10 | 120 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810418 | <10 | 160 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810423 | <10 | 70 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810436 | <10 | 70 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810440 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810444 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | 50 |
| 810448 | <10 | <50 | <10 | <10 | 30 | <1 | <10 | <10 |
| 810452 | <10 | 80 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810456 | <10 | 70 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810480 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |

Table 14. Eight Metals QC

Waters, ug/L

| Sample ID | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| Method Blank | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810407 duplicate | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810480 spike | 106%R | 94%R | 99%R | 98%R | 97%R | 100%R | 98%R | 97%R |
| spike level | 200 | 2,000 | 2,000 | 2,000 | 2,000 | 2 | 200 | 2,000 |

R - Recovery

10916 R

# CHEMICAL ANALYSIS OF WATER SAMPLES

FEBRUARY 14, 1988

FOR

CHRIS LOVEDAHL

AEROVIRONMENT, INC.

825 MYRTLE AVENUE

MONROVIA, CA 91016

BY


ACUREX CORPORATION

555 CLYDE AVENUE

MOUNTAIN VIEW, CA 94039


ACUREX Corporation

H-253

**ACUREX Corporation**

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

February 14, 1986
Acurex ID#: 8601-026


Attention: Chris Lovedahl

Subject: Thirty-four Waters for Analysis; Received 1/10/86

Selected samples were analyzed following EPA Method 601 for waters using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

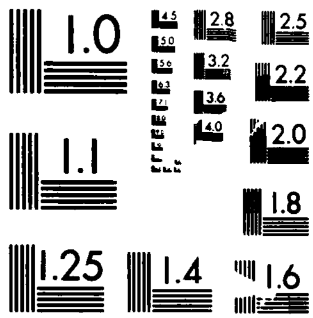
Results are presented in Table 1 including recoveries of dibromethane which was employed as a surrogate. QC results for Method 601 are presented in Table 2.

Selected samples were analyzed following EPA Method 602 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 602 are presented in Table 4.

AD-A183 482 INSTALLATION RESTORATION PROGRAM PHASE 2 6/8
CONFIRMATION/QUANTIFICATION STAG..(U) AEROVIRONMENT INC
MONROVIA CA R BAUER MAY 87 AV-FR-86/517R2
UNCLASSIFIED F33615-83-D-4000 F/G 24/4 NL




MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS-1963-A

Selected samples were analyzed for oil and grease by extracting water with freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 5 with QC results in Table 6.

Selected samples were analyzed for total phenols by distillation and measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for eight metals by digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 9 with QC results in Table 10.

Submitted by: Greg Nicoll

Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. 601 Results

| Sample ID#: | 810424 | 810428 | 810458 | 810460 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 1.5* | 1.4* | 0.9* | 0.8* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 95 | 84 | 83 | 101 |
| Analysis Date: | 1/13/86 | 1/13/86 | 1/13/86 | 1/13/86 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 601 Results
(Continued)

| Sample ID#: | 810466 | 810470 | 810472 | 810474 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.7* | 0.8* | 0.8* | 1.4* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | ND | ND | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | ND | ND |
| Tetrachloroethene[b] | | | | |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 75 | 79 | 88 | 90 |
| Analysis Date: | 1/13/86 | 1/13/86 | 1/13/86 | 1/13/86 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 1. 601 Results
(Concluded)

| Sample ID#: | 810476 | 810484 | 810488 | 810492 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Chloromethane | ND | ND | ND | ND | 0.08 |
| Bromomethane | ND | ND | ND | ND | 1 |
| Dichlorodifluoromethane | ND | ND | ND | ND | 2 |
| Vinyl chloride | ND | ND | ND | ND | 0.2 |
| Chloroethane | ND | ND | ND | ND | 0.5 |
| Methylene chloride | 0.8* | 0.6* | 1.2* | 1.2* | 0.2 |
| Trichlorofluoromethane | ND | ND | ND | ND | 1 |
| 1,1-DCE | ND | ND | ND | ND | 0.1 |
| 1,1-DCA | ND | ND | ND | ND | 0.07 |
| trans-1,2-DCE | ND | ND | ND | ND | 0.1 |
| Chloroform | ND | ND | ND | ND | 0.05 |
| 1,2-DCA | ND | ND | ND | ND | 0.03 |
| 1,1,1-TCA | ND | ND | ND | ND | 0.03 |
| Carbon tetrachloride | ND | ND | ND | ND | 0.1 |
| Bromodichloromethane | ND | ND | ND | ND | 0.1 |
| 1,2-Dichloropropane | ND | ND | ND | ND | 0.04 |
| trans-1,3-Dichloropropane | ND | ND | ND | ND | 0.3 |
| TCE | ND | ND | ND | ND | 0.1 |
| Dibromochloromethane[a] | | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND | 0.2 |
| cis-1,3-Dichloropropane[a] | | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND | 0.1 |
| Bromoform | ND | ND | ND | ND | 0.2 |
| Tetrachloroethane[b] / Tetrachloroethene[b] | ND | ND | ND | ND | 0.3 |
| Chlorobenzene | ND | ND | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | ND | ND | 0.3 |
| Surrogate Recovery, % | 116 | 88 | 100 | 89 | |
| Analysis Date: | 1/13/86 | 1/14/86 | 1/14/86 | 1/14/86 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level

Table 2. 601 QC

| Sample ID#: | Method Blank | Method Blank | Storage Blank |
|---|---|---|---|
| Compound | Concentration ug/L | | |
| Chloromethane | ND | ND | ND |
| Bromomethane | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND |
| Vinyl chloride | ND | ND | ND |
| Chloroethane | ND | ND | ND |
| Methylene chloride | 1.7 | 1.6 | 4.0 |
| Trichlorofluoromethane | ND | ND | ND |
| 1,1-DCE | ND | ND | ND |
| 1,1-DCA | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND |
| Chloroform | ND | 0.37 | 0.14 |
| 1,2-DCA | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND |
| TCE | ND | ND | ND |
| Dibromochloromethane[a] | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | |
| Chloroethylvinyl ether | ND | ND | ND |
| Bromoform | ND | ND | ND |
| Tetrachloroethane[b] | ND | ND | ND |
| Tetrachloroethene[b] | | | |
| Chlorobenzene | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND |
| Surrogate Recovery, % | 100 | * | 95 |
| Analysis Date: | 1/13/86 | 1/14/86 | 1/14/86 |

a - These compounds coelute
b - These compounds coelute
* - Error in integration - unable to measure surrogate recovery

Table 2. 601 QC
(Concluded)

| Sample ID#: | Duplicate 810484 | 810488 % Recovery (Spike Level 5 µg/L) |
|---|---|---|
| Compound | Concentration µg/L | |
| Chloromethane | ND | 96 |
| Bromomethane | ND | 88 |
| Dichlorodifluoromethane | ND | 98 |
| Vinyl chloride | ND | 98 |
| Chloroethane | ND | 104 |
| Methylene chloride | 1.1* | 99 |
| Trichlorofluoromethane | ND | 103 |
| 1,1-DCE | ND | 101 |
| 1,1-DCA | ND | 100 |
| trans-1,2-DCE | ND | 98 |
| Chloroform | ND | 86 |
| 1,2-DCA | ND | 100 |
| 1,1,1-TCA | ND | 95 |
| Carbon tetrachloride | ND | 99 |
| Bromodichloromethane | ND | 100 |
| 1,2-Dichloropropane | ND | 97 |
| trans-1,3-Dichloropropane | ND | 102 |
| TCE | ND | 102 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | 102 |
| Chloroethylvinyl ether | ND | ND |
| Bromoform | ND | 104 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | 102 |
| Chlorobenzene | ND | 97 |
| Dichlorobenzenes | ND | 102 |
| Surrogate Recovery, % | 110 | NS |
| Analysis Date: | 1/14/86 | 1/14/86 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level
NS - Not spiked

Table 3. 602 Results

| Sample ID#: | 810424 | 810428 | 810458 | 810460 | 810466 |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | 0.2 | 0.3 | ND | 0.7 | ND |
| Ethylbenzene | 0.8 | 0.5 | 0.5 | 0.6 | 0.6 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 1/13/86 | 1/13/86 | 1/13/86 | 1/13/86 | 1/13/86 |
| % Surrogate Recovery | 96 | 89 | 93 | 98 | 97 |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene

Table 3. 602 Results
(Continued)

| Sample ID#: | 810470 | 810472 | 810474 | 810476 | 810484 |
|---|---|---|---|---|---|
| Compound | Concentration μg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | 0.3 | 0.3 | 0.3 | 1.2 | 0.3 |
| Ethylbenzene | 0.7 | 0.6 | 0.6 | 0.8 | 0.5 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 1/13/86 | 1/13/86 | 1/13/86 | 1/13/86 | 1/13/86 |
| % Surrogate Recovery | 98 | 98 | 100 | 97 | 94 |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene

Table 3. 602 Results
(Concluded)

| Sample ID#: | 810488 | 810492 | Detection Limit |
| --- | --- | --- | --- |
| Compound | Concentration μg/L | | |
| Benzene | ND | ND | 0.2 |
| Toluene | ND | ND | 0.2 |
| Ethylbenzene | 0.4 | 0.6 | 0.2 |
| Chlorobenzene[1] | ND | ND | 0.2 |
| Xylenes[2] | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | 0.4 |
| Analysis Date: | 1/13/86 | 1/14/86 | |
| % Surrogate Recovery | 97 | 88 | |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 4. 602 QC

| Sample ID#: | Method Blank | Method Blank | Storage Blank | 810488 Duplicate | 810492 % Recovery (Spike Level 5 µg/L) |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | 0.3 | 91 |
| Toluene | 0.3 | 0.3 | ND | 0.5 | 94 |
| Ethylbenzene | 1.0 | 0.9 | 0.7 | 0.6 | 94 |
| Chlorobenzene[1] | ND | ND | ND | 0.2 | 93 |
| Xylenes[2] | ND | ND | ND | ND | 94 |
| Dichlorobenzenes | ND | ND | ND | ND | 92 |
| Analysis Date: | 1/13/86 | 1/13/86 | 1/13/86 | 1/13/86 | 1/14/86 |
| % Surrogate Recovery | NA | NA | NA | 101 | 101 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

NA - Not added

Table 5. Oil & Grease Results

| Sample ID | Oil & Grease, mg/L |
|---|---|
| 810434 | 0.8 |
| 810459 | <0.1 |
| 810467 | 0.5 |
| 810471 | 0.4 |
| 810473 | 0.4 |
| 810485 | 0.8 |
| 810489 | 1.4 |
| 810493 | 0.6 |

Table 6. Oil & Grease QC

| Sample ID | Oil & Grease, mg/L |
|---|---|
| Method blank | 0.2 |

Table 7. Total Phenols Results

| Sample ID | Total Phenols, μg/L |
|---|---|
| 810427 | 16 |
| 810435 | 6 |
| 810463 | 14 |
| 810469 | 20 |
| 810487 | 22 |
| 810491 | 17 |
| 810494 | 10 |

Table 8. Total Phenols QC

| Sample ID | Total Phenols, µg/L |
|---|---|
| Method Blank | 6 |
| 810427 duplicate | 14 |
| 810494 spiked at 100 µg/L | 104% Recovery |

Table 9. Eight Metals Results

| Sample ID | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| | Concentration, µg/L | | | | | | | |
| 810426 | <10 | 110 | <10 | <10 | 30 | <1 | <10 | <10 |
| 810462 | <10 | 120 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810464 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810468 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810486 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810490 | <10 | 120 | <10 | <10 | 40 | <1 | <10 | <10 |
| 810495 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |

Table 10. Eight Metals QC

Concentration, µg/L

| Sample ID | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| Method Blank | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810486 duplicate | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |

RECEIVED
JAN 27 1986
AeroVironment Inc.

# CHEMICAL ANALYSIS OF WATER SAMPLE

JANUARY 20, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

ACUREX Corporation

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

January 20, 1986
Acurex ID#: 8601-027
Page 1 of 3

Attention: Chris Lovedahl

Subject: One Water for Analysis; Received 1/11/86

One sample was analyzed for total phenols by distillation and measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Table 1 with QC results in Table 2.

Prepared by: Valerie Borsa
Valerie Borsa
Analyst

Approved by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

VB/GN/ats

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. Phenols Results

| Sample ID | Phenols, total, µg/L |
|---|---|
| 810505 | 9 |

Table 2. Phenols QC

| Sample ID | Phenols, total, µg/L |
|---|---|
| Method Blank | 6 |

# CHEMICAL ANALYSIS OF WATER SAMPLES

FEBRUARY 20, 1986



FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
555 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

ACUREX Corporation

Energy & Environmental Division

AeroVironment, Inc.
325 Myrtle Avenue
Monrovia, CA 91016

February 20, 1986
Acurex ID#: 8601-028


Attention: Chris Lovedahl

Subject: Fifty-one Waters for Analysis;
Received 1/13/85

Selected samples were analyzed following EPA Method 601 for waters using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Table 1 including recoveries of dibromethane which was employed as a surrogate. QC results for Method 601 are presented in Table 2.

Selected samples were analyzed following EPA Method 602 using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

Results are presented in Table 3, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 602 are presented in Table 4.

Selected samples were analyzed for pesticides following Method 509A and herbicides following Method 509B (Standard Methods for the Examination of Water and Wastewater, 16th edition). A 3% OV-1 column was employed as the primary column for pesticides. A 6-foot 1.5% SP-2250/1.95% SP-2401 was used as the primary column for the herbicides. Samples for pesticide analysis were extracted with methylene chloride, solvent exchanged, concentrated, and then injected into a gas chromatograph operated isothermally. Detection of the eluting compounds were performed with an electron capture detector. Samples for herbicide analysis were extracted with diethyl ether and the extract hydrolyzed. The herbicide acids were methylated and then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of the herbicides. Results of the 509A analyses are presented in Table 5 with QC results in Table 6. Results of the 509B analyses are presented in Table 7 with QC results in Table 8.

Selected samples were analyzed for EDB following the California Method. Samples for EDB analysis were extracted with hexane then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of EDB. Results of the analyses are presented in Table 9 with QC results in Table 10.

One water sample was analyzed for semivolatile organics according to U.S. EPA Method 8270 (Test Methods for Evaluating Solid Waste - SW846, 2nd Ed., 1982). Results are presented in Table 11. The method can be summarized as follows:

> One liter of sample is serially extracted with methylene chloride. The methylene chloride extracts are combined, dried and concentrated. The concentrate is injected into GC/MS systems set specifically for the separation and measurement of the priority pollutants. Qualitative identification of the priority pollutants is performed initially using the relative retention times, the relative abundance of three characteristic ions and their ratios. The entire mass spectrum is reviewed before an identification is recorded. Quantitative analysis is performed using an internal standard with a single characteristic ion.

Prior to analysis every sample is spiked with surrogate compounds as part of Acurex's Quality Control Program. These compounds simulate the behavior of compounds of interest and confirm that acceptable recoveries are being achieved on every sample. Other semivolatile QC is reported in Table 12.

Selected samples were analyzed for oil and grease by extracting the water with freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 13 with QC results in Table 14.

Selected samples were analyzed for petroleum hydrocarbons by extracting the water with freon (EPA Method 3550), passing the extract across silica gel, and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Results are presented in Table 13 with QC results in Table 14.

Selected samples were analyzed for lead by digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 15 with QC results in Table 16.

Selected samples were analyzed for eight metals by digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 17 with QC results in Table 18.

Selected samples were analyzed for chloride argentometrically by titrating with silver nitrate (Method 407A - Standard Methods for the Examination of Water and Wastewater, 16th edition). Selected samples were analyzed for nitrate using the Brucine Method (EPA Method 352.1). Selected samples were analyzed for sulfate turbidimetrically by measuring the turbidity of barium sulfate with a nephelometer (EPA Method 375.4). Results are presented in Table 19 with QC results in Table 20.

Submitted by: Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/ats

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

## Table 1. 601 Results

| Sample ID#: | 810281 | 810496 | 810500 | 810502 |
|---|---|---|---|---|
| Compound | Concentration ug/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.8* | 0.8* | 0.7* | 0.5* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | ND | ND | ND | ND |
| Chloroform | ND | 0.16 | 0.22 | ND |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | ND | 0.4 | 0.4 | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropane[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] / Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 88 | 80 | 101 | 58 |
| Analysis Date: | 1/14/86 | 1/14/86 | 1/14/86 | 1/14/86 |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level
** - Confirmed by GC/MS Method 624 (For PCA/PCE, only PCE found)

Table 1. 601 Results
(Continued)

| Sample ID#: | 810508 | 810510 | 811578 | 811582[c] |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.7* | 2.1* | 1.1* | 2.4* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-DCE | ND | ND | ND | ND |
| 1,1-DCA | ND | ND | ND | ND |
| trans-1,2-DCE | 3.8 | ND | ND | 9.8** |
| Chloroform | 0.35 | ND | ND | 0.33 |
| 1,2-DCA | ND | ND | ND | ND |
| 1,1,1-TCA | ND | 0.45 | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | 0.41 |
| trans-1,3-Dichloropropane | ND | ND | ND | ND |
| TCE | 106** | 0.5 | ND | 1.3** |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | 3.7 | ND | ND | 8.4** |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 84 | 88 | 75 | 86 |
| Analysis Date: | 1/14/86 | 1/14/86 | 1/14/86 | 1/14/86 |

a - These compounds coelute
b - These compounds coelute
c - 811582 confirmed since duplicate contained trans-1,2-DCE at 11 µg/L
* - Below normal laboratory background level
** - Confirmed by GC/MS Method 624 (For PCA/PCE, only PCE found)

Table 1. 601 Results
(Concluded)

| Sample ID#: | 811586 | 811590 | 811594 | 811577 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Chloromethane | ND | ND | ND | ND | 0.08 |
| Bromomethane | ND | ND | ND | ND | 1 |
| Dichlorodifluoromethane | ND | ND | ND | ND | 2 |
| Vinyl chloride | ND | ND | ND | ND | 0.2 |
| Chloroethane | ND | ND | ND | ND | 0.5 |
| Methylene chloride | 1.8* | 0.8* | 0.7* | 0.9* | 0.2 |
| Trichlorofluoromethane | ND | ND | ND | ND | 1 |
| 1,1-DCE | ND | ND | ND | ND | 0.1 |
| 1,1-DCA | ND | ND | ND | ND | 0.07 |
| trans-1,2-DCE | ND | 11** | 7.3 | ND | 0.1 |
| Chloroform | ND | ND | 0.38 | 0.21 | 0.05 |
| 1,2-DCA | ND | ND | ND | ND | 0.03 |
| 1,1,1-TCA | ND | ND | ND | 0.15 | 0.03 |
| Carbon tetrachloride | ND | ND | ND | ND | 0.1 |
| Bromodichloromethane | ND | ND | ND | ND | 0.1 |
| 1,2-Dichloropropane | ND | 0.24 | 0.23 | ND | 0.04 |
| trans-1,3-Dichloropropane | ND | ND | ND | ND | 0.3 |
| TCE | ND | 1.5** | 2.4** | ND | 0.1 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropane[a] | ND | ND | ND | ND | 0.2 |
| Chloroethylvinyl ether | ND | ND | ND | ND | 0.1 |
| Bromoform | ND | ND | ND | ND | 0.2 |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | 9.7** | 5.7** | ND | 0.3 |
| Chlorobenzene | ND | ND | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | ND | ND | 0.3 |
| Surrogate Recovery, % | 103 | 80 | 97 | 88 | |
| Analysis Date: | 1/15/86 | 1/15/86 | 1/15/86 | 1/15/86 | |

a - These compounds coelute
b - These compounds coelute
* - Below normal laboratory background level
** - Confirmed by GC/MS Method 624 (For PCA/PCE, only PCE found)

Table 2. 601 QC

| Sample ID#: | Method Blank | Method Blank | Storage Blank | 811582 Duplicate | 811586 % Recovery (Spike Level 5 ug/L) |
|---|---|---|---|---|---|
| Compound | Concentration ug/L | | | | |
| Chloromethane | ND | ND | ND | ND | 92 |
| Bromomethane | ND | ND | ND | ND | 101 |
| Dichlorodifluoromethane | ND | ND | ND | ND | 98 |
| Vinyl chloride | ND | ND | ND | ND | 98 |
| Chloroethane | ND | ND | ND | ND | 95 |
| Methylene chloride | 1.6 | 1.5 | 0.7 | 2.0* | 95 |
| Trichlorofluoromethane | ND | ND | ND | ND | 100 |
| 1,1-DCE | ND | ND | ND | ND | 95 |
| 1,1-DCA | ND | ND | ND | ND | 101 |
| trans-1,2-DCE | ND | ND | ND | 11 | 100 |
| Chloroform | 0.14 | ND | ND | 0.46 | 95 |
| 1,2-DCA | ND | ND | ND | ND | 91 |
| 1,1,1-TCA | ND | ND | ND | ND | 96 |
| Carbon tetrachloride | ND | ND | ND | ND | 97 |
| Bromodichloromethane | ND | ND | ND | ND | 87 |
| 1,2-Dichloropropane | ND | ND | ND | 0.47 | 90 |
| trans-1,3-Dichloropropane | ND | ND | ND | ND | 95 |
| TCE | ND | ND | ND | 1.3 | 94 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | ND | ND | ND | 88 |
| Chloroethylvinyl ether | ND | ND | ND | ND | 87 |
| Bromoform | ND | ND | ND | ND | 71 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | 8.3 | 92 |
| Chlorobenzene | ND | ND | ND | ND | 96 |
| Dichlorobenzenes | ND | ND | ND | ND | 98 |
| Surrogate Recovery, % | * | 100 | 82 | 116 | NS |
| Analysis Date: | 1/15/86 | 1/15/86 | 1/15/86 | 1/15/86 | 1/15/86 |

a - These compounds coelute
b - These compounds coelute
* - Integration error
NS - Not spiked

Table 3. 602 Results

| Sample ID#: | 810281 | 810496 | 810500 | 810502 | 810508 |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | 0.2 | ND | ND | ND |
| Ethylbenzene | 0.7 | 0.8 | 0.7 | 0.6 | 0.8 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 1/14/86 | 1/14/86 | 1/14/86 | 1/14/86 | 1/14/86 |
| % Surrogate Recovery | 91 | 103 | 90 | 94 | 99 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 3. 602 Results
(Continued)

| Sample ID#: | 810510 | 810578 | 811582 | 811586 | 811590 |
|---|---|---|---|---|---|
| Compound | Concentration ug/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | 0.2 | ND | 0.5 |
| Ethylbenzene | 0.7 | 0.5 | 0.5 | 0.5 | 0.6 |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 1/14/86 | 1/14/86 | 1/14/86 | 1/14/86 | 1/14/86 |
| % Surrogate Recovery | 97 | 93 | 98 | 98 | 94 |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

Table 3. 602 Results
(Concluded)

| Sample ID#: | 811594 | Detection Limit |
|---|---|---|
| Compound | Concentration ug/L | |
| Benzene | ND | 0.0002 |
| Toluene | 0.3 | 0.0002 |
| Ethylbenzene | 0.8 | 0.0002 |
| Chlorobenzene[1] | ND | 0.0002 |
| Xylenes[2] | ND | 0.0002 |
| Dichlorobenzenes | ND | 0.0004 |
| Analysis Date: | 1/15/86 | |
| % Surrogate Recovery | 104 | |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

Table 4. 602 QC

| Sample ID#: | Method Blank | Method Blank | Storage Blank | Duplicate 811594 | 811579 % Recovery (Spike Level 0.005 ug/L) |
|---|---|---|---|---|---|
| Compound | Concentration ug/L | | | | |
| Benzene | ND | 0.2 | ND | 0.2 | 92 |
| Toluene | 0.3 | 0.4 | ND | 0.3 | 91 |
| Ethylbenzene | 0.9 | 1.2 | 0.7 | 0.8 | 86 |
| Chlorobenzene[1] | ND | ND | ND | ND | 89 |
| Xylenes[2] | ND | ND | 0.2 | ND | 88 |
| Dichlorobenzenes | ND | ND | ND | ND | 79 |
| Analysis Date: | 1/14/86 | 1/15/86 | 1/15/86 | 1/15/86 | 1/15/86 |
| % Surrogate Recovery | NS | 100 | 98 | 104 | 90 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

NS - Not spiked

Table 5. 509A Results

| Sample ID#: | 810499 | 810506 | 810871 | 811575 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration ug/L | | | | |
| Aldrin | ND | ND | ND | ND | 0.05 |
| Dieldrin | ND | ND | ND | ND | 0.10 |
| Chlordane | ND | ND | ND | ND | 0.5 |
| 4,4'-DDT | ND | ND | ND | ND | 0.10 |
| 4,4'-DDE | ND | ND | ND | ND | 0.10 |
| 4,4'-DDD | ND | ND | ND | ND | 0.10 |
| alpha-Endosulfan | ND | ND | ND | ND | 0.05 |
| beta-endosulfan | ND | ND | ND | ND | 0.10 |
| Endosulfan sulfate | ND | ND | ND | ND | 0.10 |
| Endrin | ND | ND | ND | ND | 0.02 |
| Endrin aldehyde | ND | ND | ND | ND | 0.10 |
| Heptachlor | ND | ND | ND | ND | 0.05 |
| Heptachlor epoxide | ND | ND | ND | ND | 0.05 |
| alpha-BHC | ND | ND | ND | ND | 0.05 |
| beta-BHC | ND | ND | ND | ND | 0.05 |
| delta-BHC | ND | ND | ND | ND | 0.05 |
| gamma-BHC (Lindane) | ND | ND | ND | ND | 0.01 |
| Toxaphene | ND | ND | ND | ND | 1.0 |
| Strobane | ND | ND | ND | ND | 1.0 |
| Dichloran | ND | ND | ND | ND | 0.05 |
| PCNB | ND | ND | ND | ND | 0.05 |
| Captan | ND | ND | ND | ND | 0.10 |
| Mirex | ND | ND | ND | ND | 0.10 |
| Methoxychlor | ND | ND | ND | ND | 0.2 |

ND - Not detected

Table 6. 8094 QC Results

| Sample ID#: | Method Blank |
|---|---|
| **Compound** | **Concentration, µg/L** |
| Aldrin | ND |
| Dieldrin | ND |
| Chlordane | ND |
| 4,4'-DDT | ND |
| 4,4'-DDE | ND |
| 4,4'-DDD | ND |
| alpha-Endosulfan | ND |
| beta-endosulfan | ND |
| Endosulfan sulfate | ND |
| Endrin | ND |
| Endrin aldehyde | ND |
| Heptachlor | ND |
| Heptachlor epoxide | ND |
| alpha-BHC | ND |
| beta-BHC | ND |
| delta-BHC | ND |
| gamma-BHC (Lindane) | ND |
| Toxaphene | ND |
| Strobane | ND |
| Dichloran | ND |
| PCNB | ND |
| Captan | ND |
| Mirex | ND |
| Methoxychlor | ND |

ND - Not detected

Table 7. 5098 Results

| Sample ID#: | 810499 | 810506 | 810871 | 811575 | Detection Limit |
|---|---|---|---|---|---|
| Compound | Concentration μg/L | | | | |
| 2,4-D | ND | ND | ND | ND | 0.06 |
| 2,4,5-T | ND | ND | ND | ND | 0.06 |
| Silvex | ND | ND | ND | ND | 0.06 |

ND - Not detected

Table 8. 509B QC

| Sample ID#: | Method Blank | 811575 Duplicate | 810871 % Recovery (Spike Level 0.3µg/L |
|---|---|---|---|
| Compound | Concentration µg/L | | |
| 2,4-D | ND | ND | 56 |
| 2,4,5-T | ND | ND | 43 |
| Silvex | ND | ND | 50 |

ND - Not detected

Table 9. EDB Results

| Sample ID | EDB, µg/L |
|---|---|
| 810283 | ND |
| 811584 | ND |
| 811588 | ND |
| | |
| Detection Limit | 0.02 |

ND - Not detected

Table 10. EDB QC

| Sample ID | EDB, µg/L |
|---|---|
| Method Blank | ND |
| 810283 duplicate | ND |
| 811504 spiked at 2 µg/L | 49% Recovery |

ND - Not detected

Table 11. 624 Results

| Sample ID#: | 810513 |
|---|---|
| **Priority Pollutants** | **Concentration (µg/L)** |
| Phenol | 4 |
| Bis(2-ethylhexyl)phthalate | 5* |
| All Other Priority Pollutants | ND |
| Detection Limit | 2 |

| Surrogate Recoveries | Percent (%) |
|---|---|
| 2-Fluorophenol | 84 |
| Phenol-$d_5$ | 74 |
| Nitrobenzene-$d_5$ | 72 |
| 2-Fluorobiphenyl | 68 |
| 2,4,6-Tribromophenol | 88 |
| Terphenyl-$d_{14}$ | 112 |

ND - Not Detected

* Found at laboratory background levels.

Table 12. 624 QC

| Sample ID#: | Method Blank |
|---|---|
| **Priority Pollutants** | **Concentration (µg/L)** |
| Benzyl butyl phthalate | 2 |
| All Other Priority Pollutants | ND |
| Detection Limit | 2 |
| **Surrogate Recoveries** | **Percent (%)** |
| 2-Fluorophenol | 64 |
| Phenol-$d_5$ | 64 |
| Nitrobenzene-$d_5$ | 72 |
| 2-Fluorobiphenyl | 66 |
| 2,4,6-Tribromophenol | 85 |
| Terphenyl-$d_{14}$ | 110 |

ND - Not Detected

Table 13. Oil & Grease/Petroleum Hydrocarbons Results

| Sample ID | Oil & Grease, mg/L | Petroleum Hydrocarbons, mg/L |
|---|---|---|
| 810282 | 0.6 | NA |
| 810425 | 1.5 | 1.2 |
| 810461 | 0.7 | NA |
| 810475 | 0.7 | NA |
| 810477 | 0.5 | NA |
| 810497 | 2.8 | NA |
| 810501 | 0.2 | NA |
| 810503 | 0.4 | NA |
| 810507 | 1.2 | NA |
| 810511 | 3.6 | NA |
| 811579 | 1.2 | NA |
| 811583 | 1.8 | NA |
| 811587 | 0.8 | NA |
| 811591 | 0.7 | NA |
| 811595 | 0.7 | NA |

NA - Not analyzed

Table 13. Oil & Grease/Petroleum Hydrocarbons QC

| Sample ID | Oil & Grease, mg/L | Petroleum Hydrocarbons, mg/L |
|---|---|---|
| Method blank | 0.2 | 0.2 |

Table 15. Lead Results

| Sample ID | Lead µg/L |
|---|---|
| 810284 | 30 |
| 811585 | <20 |
| 811589 | <20 |

Table 15. Lead QC

| Sample ID | Lead μg/L |
|---|---|
| Method Blank | <20 |

Table 17. Eight Metals Results

Waters, ug/L

| Sample ID | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| 810465 | <10 | <50 | <10 | <10 | <20 | 2 | <10 | <10 |
| 810498 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | 40 |
| 810504 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810509 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |
| 810512 | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |

Table 18. Eight Metals QC

Waters, µg/L

| Sample ID | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|
| Method Blank | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 |

Table 19. Anion Results

| Sample ID | Chloride, mg/L | Nitrate as N, mg/L | Sulfate, mg/L |
|---|---|---|---|
| 811574 | NA | <0.1 | NA |
| 811581 | NA | 2.4 | NA |
| 811593 | NA | 3.8 | NA |
| 811597 | NA | 3.2 | NA |
| 811576 | 1 | NA | <1 |
| 811580 | 7 | NA | 3 |
| 811592 | 4 | NA | 7 |
| 811596 | 3 | NA | 8 |

NA - Not analyzed

Table 20. Anion Results

| Sample ID | Chloride, mg/L | Nitrate as N, mg/L | Sulfate, mg/L |
|---|---|---|---|
| Method blank | <1 | <0.1 | <1 |
| 811576 duplicate | 1 | 3.4 | 8 |
| 811574 spiked at 0.2 µg/L | NA | 125% | NA |

NA - Not analyzed

# CHEMICAL ANALYSIS OF WATER AND SOIL SAMPLES

APRIL 23, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
485 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

# ACUREX Corporation

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

April 23, 1986
Acurex ID#: 8604-037
8604-039
8604-041
8604-044


Attention: Chris Lovedahl

Subject: Analysis of Four Waters Received 4/16/86, Eight Waters Received 4/17/86, Twenty-seven Waters Received 4/18/86, and Seven Soils Received 4/18/86

The above samples were analyzed for total phenols by distillation and measurement of a colored complex by UV-visible spectroscopy employing EPA Method 420.1. Results are presented in Tables 1 and 2 with QC results in Tables 3 and 4.

Prepared by: Valerie Borsa
Valerie Borsa
Analyst

Approved by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

VB/GN/ats



555 Clyde Avenue, PO Box 7555, Mountain View CA 94039 (415) 964-3200 Telex 34-6391 TWX 910-7796593

Table 1. Phenols Results (Waters)

| Sample ID | Received Date | Analysis Finished Date | Analysis Finished Time | Phenols, total, µg/L |
|---|---|---|---|---|
| 906059 | 4/16/86 | 4/17/86 | 0328 | 10 |
| 906062 | 4/16/86 | 4/17/86 | 0328 | 9 |
| 906066 | 4/15/86 | 4/17/86 | 0328 | 12 |
| 906071 | 4/16/86 | 4/17/86 | 0328 | 14 |
| 906041 | 4/17/86 | 4/17/86 | 1945 | <1 |
| 906046 | 4/17/86 | 4/17/86 | 1945 | 2[a] |
| 906075 | 4/17/86 | 4/17/86 | 1945 | <1 |
| 906078 | 4/17/86 | 4/17/86 | 1945 | <1 |
| 906081 | 4/17/86 | 4/17/86 | 1945 | <1 |
| 906088 | 4/17/86 | 4/17/86 | 1945 | 6[a] |
| 906093 | 4/17/86 | 4/17/86 | 1945 | <1 |
| 906099 | 4/17/86 | 4/17/86 | 1945 | 7[a] |
| 906131 | 4/18/86 | 4/18/86 | 1935 | <1 |
| 906136 | 4/18/86 | 4/18/86 | 1935 | 8 |
| 906143 | 4/18/86 | 4/18/86 | 1935 | 3 |
| 906147 | 4/18/86 | 4/18/86 | 1935 | 7 |
| 906159 | 4/18/86 | 4/18/86 | 1935 | 8 |
| 906162 | 4/18/86 | 4/18/86 | 1935 | 6 |
| 906173 | 4/18/86 | 4/18/86 | 1935 | 5 |
| 906245 | 4/18/86 | 4/18/86 | 1935 | 18 |
| 906250 | 4/18/86 | 4/18/86 | 1935 | 12 |

[a] Value is lower than method blank value.

Table 1. Phenols Results (Waters)
(Concluded)

| Sample ID | Received Date | Analysis Finished Date | Analysis Finished Time | Phenols, total, µg/L |
|---|---|---|---|---|
| 906117 | 4/18/86 | 4/19/86 | 1230 | 17 |
| 906118 | 4/18/86 | 4/19/86 | 1230 | 13 |
| 906119 | 4/18/86 | 4/19/86 | 1230 | 35 |
| 906120 | 4/18/86 | 4/19/86 | 1230 | 46 |
| 906176 | 4/18/86 | 4/19/86 | 1230 | 14 |
| 906180 | 4/18/86 | 4/19/86 | 1230 | 8 |
| 906184 | 4/18/86 | 4/19/86 | 1230 | 22 |
| 906188 | 4/18/86 | 4/19/86 | 1230 | 15 |
| 906192 | 4/18/86 | 4/19/86 | 1230 | 29 |
| 906196 | 4/18/86 | 4/19/86 | 1230 | 28 |
| 906210 | 4/18/86 | 4/19/86 | 1230 | 23 |
| 906221 | 4/18/86 | 4/19/86 | 1230 | 9 |
| BP2-G-2 | 4/18/86 | 4/19/86 | 1230 | 37 |
| BP3-G-2 | 4/18/86 | 4/19/86 | 1230 | 26 |
| BP4-G-2 | 4/18/86 | 4/19/86 | 1230 | 33 |
| BP5-G-2 | 4/18/86 | 4/19/86 | 1230 | 31 |
| BP6-G-2 | 4/18/86 | 4/19/86 | 1230 | 25 |
| BP9-G-2 | 4/18/86 | 4/19/86 | 1230 | 27 |

Table 2. Phenols Results (Soils)

| Sample ID | Received Date | Analysis Finished Date | Analysis Finished Time | Phenols, total, µg/g |
|---|---|---|---|---|
| 906103 | 4/18/86 | 4/19/86 | 1935 | <1 |
| 906104 | 4/18/86 | 4/19/86 | 1935 | <1 |
| 906105 | 4/18/86 | 4/19/86 | 1935 | <1 |
| 906108 | 4/18/86 | 4/19/86 | 1935 | <1 |
| 906121 | 4/18/86 | 4/19/86 | 1935 | 19 |
| 906122 | 4/18/86 | 4/19/86 | 1935 | <1 |
| 906123 | 4/18/86 | 4/19/86 | 1935 | <1 |

Table 3. Phenols QC (Waters)

| Sample ID | Received Date | Analysis Finished Date | Analysis Finished Time | Phenols, total, µg/L |
|---|---|---|---|---|
| Method Blank | -- | 4/17/86 | 0328 | <1 |
| Method Blank | -- | 4/17/86 | 1945 | 8 |
| 906046 duplicate | 4/17/86 | 4/17/86 | 1945 | 3 |
| 906081 duplicate | 4/17/86 | 4/17/86 | 1945 | <1 |
| 906088 spiked at 100 µg/L | 4/17/86 | 4/17/86 | 1945 | 90% Recovery |
| Method Blank | -- | 4/18/86 | 1935 | <1 |
| 906159 duplicate | 4/18/86 | 4/18/86 | 1935 | 8 |
| 906162 spiked at 100 µg/L | 4/18/86 | 4/18/86 | 1935 | 89% Recovery |
| Method Blank | -- | 4/19/86 | 1230 | 8 |
| Method Blank | -- | 4/19/86 | 1230 | 6 |
| 906221 duplicate | 4/18/86 | 4/19/86 | 1230 | 10 |
| BP2-G-2 duplicate | 4/18/86 | 4/19/86 | 1230 | 37 |
| BP3-G-2 spiked at 100 µg/L | 4/18/86 | 4/19/86 | 1230 | 93% Recovery |

Table 4. Phenols QC (Soils)

| Sample ID | Received Date | Analysis Finished Date | Analysis Finished Time | Phenols, total, μg/g |
|---|---|---|---|---|
| Method Blank | -- | 4/19/86 | 1935 | <1 |
| 906123 duplicate | 4/18/86 | 4/19/86 | 1935 | <1 |

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AeroVironment Inc.

# CHEMICAL ANALYSIS OF WATER SAMPLES

MAY 5, 1986

FOR

CHRIS LOVEDAHL

AEROVIRONMENT, INC.

825 MYRTLE AVENUE

MONROVIA, CA 91016

BY

ACUREX CORPORATION

485 CLYDE AVENUE

MOUNTAIN VIEW, CA 94039

**ACUREX Corporation**

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

May 5 , 1986
Acurex ID#: 8604-039D
8604-041D
8604-044D



Attention: Chris Lovedahl

Subject: Analysis of Seven Waters Received 4/17/86, Eight Waters Received 4/18/86, and One Water Received 4/18/86

The above water samples were analyzed for chlorinated pesticides according to Method 509A (Standard Methods for the Examination of Water and Wastewater, 16th edition). Results are presented in Table 1. The method can be summarized as follows:

> A measured volume of sample is extracted with methylene chloride. The methylene chloride extract is dried and exchanged to hexane during concentration to a final volume of 10 mL. The concentrate is injected into a gas chromatograph equipped with an electron capture detector and a 1.5% OV-17 + 1.95% OV-210 column for the separation and measurement of chlorinated pesticides.

Results are presented in Table 1 with QC results presented in Table 2.

Submitted by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila
Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/esl

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. 509A Results

| Compound | AeroVironment Sample ID 906037 | 906042 | 906047 | 906048 |
|---|---|---|---|---|
| | Concentration (µg/L) | | | |
| Aldrin | ND | ND | ND | ND |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-Endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | 0.01 | 0.04 | 0.12 | 0.10 |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |
| Date Extracted: | 4/21/86 | 4/21/86 | 4/21/86 | 4/21/86 |
| Date Analyzed: | 4/24/86 | 4/24/86 | 4/24/86 | 4/24/86 |

ND - Not detected

Table 1. 509A Results
(Continued)

| Compound | AeroVironment Sample ID 906089 | 906094 | 906101 | 906130 |
|---|---|---|---|---|
| | Concentration (µg/L) | | | |
| Aldrin | ND | ND | ND | ND |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-Endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | 0.06 | 0.10 | 0.03 | ND |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |
| Date Extracted: | 4/21/86 | 4/21/86 | 4/21/86 | 4/22/86 |
| Date Analyzed: | 4/24/86 | 4/24/86 | 4/24/86 | 4/25/86 |

ND - Not detected

Table 1. 509A Results
(Continued)

| | AeroVironment Sample ID | | | |
|---|---|---|---|---|
| | 906102 | 906137 | 906142 | 906149 |
| Compound | Concentration (µg/L) | | | |
| Aldrin | ND | 0.05 | ND | 0.06 |
| Dieldrin | ND | ND | ND | ND |
| Chlordane | ND | ND | ND | ND |
| 4,4'-DDT | ND | ND | ND | ND |
| 4,4'-DDE | ND | ND | ND | ND |
| 4,4'-DDD | ND | ND | ND | ND |
| alpha-Endosulfan | ND | ND | ND | ND |
| beta-Endosulfan | ND | ND | ND | ND |
| Endosulfan sulfate | ND | ND | ND | ND |
| Endrin | ND | ND | ND | ND |
| Endrin aldehyde | ND | ND | ND | ND |
| Heptachlor | ND | ND | ND | ND |
| Heptachlor epoxide | ND | ND | ND | ND |
| alpha-BHC | ND | ND | ND | ND |
| beta-BHC | ND | ND | ND | ND |
| delta-BHC | ND | ND | ND | ND |
| gamma-BHC (Lindane) | ND | 0.04 | ND | 0.05 |
| Toxaphene | ND | ND | ND | ND |
| Strobane | ND | ND | ND | ND |
| Dichloran | ND | ND | ND | ND |
| PCNB | ND | ND | ND | ND |
| Captan | ND | ND | ND | ND |
| Mirex | ND | ND | ND | ND |
| Methoxychlor | ND | ND | ND | ND |
| Date Extracted: | 4/22/86 | 4/22/86 | 4/22/86 | 4/22/86 |
| Date Analyzed: | 4/25/86 | 4/28/86 | 4/25/86 | 4/28/86 |

ND - Not detected

Table 1. 509A Results
(Concluded)

| Compound | 906171 | 906244 | 906249 | 906220 | Detection Limit |
|---|---|---|---|---|---|
| | Concentration (µg/L) | | | | |
| Aldrin | ND | 0.07 | 0.07 | ND | 0.05 |
| Dieldrin | ND | ND | ND | ND | 0.10 |
| Chlordane | ND | ND | ND | ND | 0.50 |
| 4,4'-DDT | ND | ND | ND | ND | 0.10 |
| 4,4'-DDE | ND | ND | ND | ND | 0.10 |
| 4,4'-DDD | ND | ND | ND | ND | 0.10 |
| alpha-Endosulfan | ND | ND | ND | ND | 0.05 |
| beta-Endosulfan | ND | ND | ND | ND | 0.10 |
| Endosulfan sulfate | ND | ND | ND | ND | 0.10 |
| Endrin | ND | ND | ND | ND | 0.02 |
| Endrin aldehyde | ND | ND | ND | ND | 0.10 |
| Heptachlor | ND | ND | ND | ND | 0.05 |
| Heptachlor epoxide | ND | ND | ND | ND | 0.05 |
| alpha-BHC | ND | ND | ND | ND | 0.05 |
| beta-BHC | ND | ND | ND | ND | 0.05 |
| delta-BHC | ND | ND | ND | ND | 0.05 |
| gamma-BHC (Lindane) | 0.01 | 0.06 | 0.06 | ND | 0.01 |
| Toxaphene | ND | ND | ND | ND | 1.0 |
| Strobane | ND | ND | ND | ND | 1.0 |
| Dichloran | ND | ND | ND | ND | 0.05 |
| PCNB | ND | ND | ND | ND | 0.05 |
| Captan | ND | ND | ND | ND | 0.10 |
| Mirex | ND | ND | ND | ND | 0.10 |
| Methoxychlor | ND | ND | ND | ND | 0.2 |
| Date extracted: | 4/22/86 | 4/22/86 | 4/22/86 | 4/22/86 | |
| Date Analyzed: | 4/25/86 | 4/28/86 | 4/28/86 | 4/28/86 | |

AeroVironment Sample ID (columns 906171, 906244, 906249, 906220)

ND - Not detected

Table 2 509A Results QC

AeroVironment Sample ID

| Compound | Method Blank | Method Blank | 906037 Duplicate | 906130 Spike % Recovery[1] |
|---|---|---|---|---|
| | Concentration (µg/L) | | | |
| Aldrin | ND | ND | ND | 87 |
| Dieldrin | ND | ND | ND | 97 |
| Chlordane | ND | ND | ND | NS |
| 4,4'-DDT | ND | ND | ND | 92 |
| 4,4'-DDE | ND | ND | ND | NS |
| 4,4'-DDD | ND | ND | ND | NS |
| alpha-Endosulfan | ND | ND | ND | NS |
| beta-Endosulfan | ND | ND | ND | NS |
| Endosulfan sulfate | ND | ND | ND | NS |
| Endrin | ND | ND | ND | 91 |
| Endrin aldehyde | ND | ND | ND | NS |
| Heptachlor | ND | ND | ND | 80 |
| Heptachlor epoxide | ND | ND | ND | NS |
| alpha-BHC | ND | ND | ND | NS |
| beta-BHC | ND | ND | ND | NS |
| delta-BHC | ND | ND | ND | NS |
| gamma-BHC (Lindane) | ND | ND | 0.05 | 90 |
| Toxaphene | ND | ND | ND | NS |
| Strobane | ND | ND | ND | NS |
| Dichloran | ND | ND | ND | NS |
| PCNB | ND | ND | ND | NS |
| Captan | ND | ND | ND | NS |
| Mirex | ND | ND | ND | NS |
| Methoxychlor | ND | ND | ND | NS |
| Date Extracted: | 4/21/86 | 4/22/86 | 4/21/86 | 4/22/86 |
| Date Analyzed: | 4/24/86 | 4/25/86 | 4/24/86 | 4/25/86 |

ND - Not detected
NS - Not spiked
1 Aldrin, Heptachlor, and gamma-BHC spiked at 0.2 µg/L
Dieldrin, p,p'-DDT, and Endrin spiked at 0.5 µg/L

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... 9 1986
AeroVironment Inc.

# CHEMICAL ANALYSIS OF WATER SAMPLES

MAY 6, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
485 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

**ACUREX Corporation**

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

May 6, 1986
Acurex ID#: 8604-037B
8604-039B
8604-041B
8604-044B



Attention: Chris Lovedahl

Subject: Analysis of Five Waters Received 4/16/86, Eight Waters Received 4/17/86, Nine Waters Received 4/18/86, and Sixteen Waters Received 4/18/86; Revised Report

Selected samples were analyzed for lead or eight metals by rigorous digestion with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Tables 1 and 2 with QC results in Tables 3 and 4.

Prepared by: Patrick M. Hirata
Patrick M. Hirata
Chemist

Approved by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

GN/VLA/ats

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. Lead Results

| Sample ID | Received Date | Analysis Date | Lead, µg/L |
|---|---|---|---|
| 906063 | 4/16/86 | 4/23/86 | <20 |
| 906067 | 4/16/86 | 4/23/86 | <20 |
| 906068 | 4/16/86 | 4/23/86 | <20 |
| 906072 | 4/16/86 | 4/23/86 | <20 |
| 906076 | 4/17/86 | 4/23/86 | <20 |
| 906082 | 4/17/86 | 4/23/86 | <20 |

Table 2. Eight Metals Results, µg/L

| Sample ID: | Date Received | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|---|
| 906058 | 4/16/86 | <10 | 360 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906040 | 4/17/86 | <10 | 50 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906045 | 4/17/86 | <10 | 210 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906077 | 4/17/86 | <10 | 130 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906087 | 4/17/86 | <10 | 120 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906092 | 4/17/86 | <10 | <40 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906098 | 4/17/86 | <10 | 90 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906129 | 4/18/86 | <10 | 50 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906133 | 4/18/86 | <10 | 140 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906138 | 4/18/86 | <10 | 80 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906141 | 4/18/86 | <10 | 100 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906148 | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906154 | 4/18/36 | <10 | 60 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906243 | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906248 | 4/18/86 | <10 | 50 | <10 | <10 | <20 | <1 | <20 | 40 |
| 906252 | 4/18/86 | <10 | 70 | <10 | 80 | <20 | <1 | <20 | <10 |
| 906179 | 4/18/86 | <10 | 250 | <10 | <10 | <20 | <1* | <20 | <10 |
| 906183 | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1* | <20 | <10 |
| 906187 | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1* | <20 | <10 |
| 906191 | 4/18/86 | <10 | 190 | <10 | 20 | 50 | <1* | <20 | <10 |
| 906195 | 4/18/86 | <10 | <40 | <10 | <10 | 40 | <1* | <20 | <10 |
| 906202 | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1* | <20 | <10 |
| 906209 | 4/18/86 | <10 | 180 | <10 | <10 | <20 | <1* | <20 | <10 |
| 906222 | 4/18/86 | <10 | 50 | <10 | <10 | <20 | <1* | <20 | 30 |
| 906212 | 4/18/86 | <10 | 50 | <10 | <10 | <20 | <1* | <20 | <10 |
| 906216 | 4/18/86 | <10 | 160 | <10 | <10 | <20 | <1* | <20 | <10 |
| BP2-G2 | 4/18/86 | <10 | 50 | <10 | <10 | <20 | <1* | <20 | <10 |
| BP3-G2 | 4/18/86 | <10 | 90 | <10 | <10 | <20 | <1* | <20 | <10 |
| BP4-G2 | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1* | <20 | <10 |
| BP5-G2 | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1* | <20 | <10 |
| BP6-G2 | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1* | 30 | <10 |
| BP9-G2 | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1* | <20 | <10 |
| Analysis Date: | | 4/24/86 | 4/23/86 | 4/23/86 | 4/23/86 | 4/23/36 | 4/25/86 *4/30/86 | 4/25/86 | 4/23/86 |

Table 3. Lead QC

| Sample ID | Received Date | Analysis Date | Lead, µg/L |
|---|---|---|---|
| Method Blank | -- | 4/23/86 | <20 |
| 906072 duplicate | 4/16/86 | 4/23/86 | <20 |

Table 4. Eight Metals QC, µg/L

| Sample ID: | Date Received | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver |
|---|---|---|---|---|---|---|---|---|---|
| Method Blank | -- | <10 | <40 | <10 | <10 | <20 | <1 | <20 | <10 |
| Method Blank | -- | <10 | <40 | <10 | <10 | <20 | <1 | <20 | <10 |
| Method Blank | -- | <10 | 50 | <10 | <10 | <20 | <1 | <20 | <10 |
| Method Blank | -- | <10 | <40 | <10 | <10 | <20 | <1* | <20 | <10 |
| 906098 duplicate | 4/17/86 | <10 | 80 | <10 | <10 | <20 | <1 | <20 | <10 |
| 906154 duplicate | 4/18/86 | <10 | 110 | <10 | <10 | <20 | <1 | <20 | <10 |
| BP9-G2 duplicate | 4/18/86 | <10 | <40 | <10 | <10 | <20 | <1* | <20 | <10 |
| 906092 spike | 4/17/86 | 113%R | 101%R | 95%R | 112%R | 100%R | 75%R | 115%R | 98%R |
| BP2-G2 spike | 4/18/86 | 88%R | 103%R | 99%R | 114%R | 100%R | 75%R* | 135%R | 95%R |
| Spike Level | | 200 | 2,000 | 2,000 | 2,000 | 2,000 | 4 | 200 | 2,000 |
| Analysis Date | | 4/24/86 | 4/23/86 | 4/23/86 | 4/23/86 | 4/23/86 | 4/25/86 *4/30/86 | 4/25/86 | 4/23/86 |

R - Recovery

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[illegible]
AeroVironment Inc.

# CHEMICAL ANALYSIS OF WATER SAMPLES

MAY 5, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
485 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

ACUREX
Corporation

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

May 5, 1986
Acurex ID#: 8604-041C
8604-044C



Attention: Chris Lovedahl

Subject: Analysis of Two Waters, Received 4/18/86
and Four Waters, Received 4/18/86

Six water samples were analyzed for semivolatile organics according to U.S. EPA Method 625 (Federal Register, Volume 49 #209, Oct. 26, 1984; Page 153). Results are presented in Table 1. The method can be summarized as follows:

> One liter of sample is serially extracted with methylene chloride at a pH greater than 11 and again at pH less than 2. The two methylene chloride extracts are dried and each concentrated to a volume of 1 mL. The concentrate is injected into GC/MS systems set specifically for the separation and measurement of the priority pollutants. Qualitative identification of the priority pollutants is performed initially using the relative retention times, the relative abundance of three characteristic ions and their ratios. The entire mass spectrum is reviewed before an identification is recorded. Quantitative analysis is performed using an internal standard with a single characteristic ion.

Prior to analysis every sample is spiked with surrogate compounds as part of Acurex's Quality Control Program. These compounds simulate the behavior of compounds of interest and confirm that acceptable recoveries are being achieved on every sample. The results of surrogate recoveries are reported with the sample results. The method blank is reported in Table 2.

Submitted by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

Richard Scott
Richard Scott
Manager, GC/MS Operations

GN/RS/esl



555 Clyde Avenue, P.O. Box 7555, Mountain View, CA 94039 (415) 964-3200 Telex 34-6391 TWX 910-7796593

Table 1. 625 Results

| Sample ID#: | 906151 | 906155 | 906201 |
| --- | --- | --- | --- |
| **Priority Pollutants** | Concentration (µg/L) | | |
| Phenol | 5 | ND | ND |
| Bis(2-ethylhexyl)phthalate | 32* | 14* | 18* |
| Di-n-Octyl phthalate | 2* | ND | ND |
| All Other Priority Pollutants | ND | ND | ND |
| Detection Limit | 2 | 2 | 2 |
| **Surrogate Recoveries** | Percent (%) | | |
| 2-Fluorophenol | 32 | 35 | 37 |
| Phenol-$d_5$ | 21 | 26 | 26 |
| Nitrobenzene-$d_5$ | 71 | 53 | 57 |
| 2-Fluorobiphenyl | 66 | 46 | 49 |
| 2,4,6-Tribromophenol | 57 | 51 | 61 |
| Terphenyl-$d_{14}$ | 74 | 74 | 63 |
| Extraction Date: | 4/22/86 | 4/22/86 | 4/22/86 |
| Analysis Date: | 4/29/86 | 4/29/86 | 4/29/86 |

ND - Not Detected

* At normal background levels

Table 1. 625 Results
(Concluded)

| Sample ID#: | 906211 | 906215 | 906219 |
|---|---|---|---|
| Priority Pollutants | Concentration (µg/L) | | |
| Phenol | ND | ND | ND |
| Bis(2-ethylhexyl)phthalate | 23* | 24* | 14* |
| Di-n-Octyl phthalate | ND | ND | ND |
| All Other Priority Pollutants | ND | ND | ND |
| Detection Limit | 2 | 2 | 2 |
| Surrogate Recoveries | Percent (%) | | |
| 2-Fluorophenol | 40 | 29 | 39 |
| Phenol-$d_5$ | 28 | 22 | 30 |
| Nitrobenzene-$d_5$ | 65 | 59 | 58 |
| 2-Fluorobiphenyl | 56 | 52 | 47 |
| 2,4,6-Tribromophenol | 57 | 51 | 49 |
| Terphenyl-$d_{14}$ | 63 | 75 | 75 |
| Extraction Date: | 4/22/86 | 4/22/86 | 4/22/86 |
| Analysis Date: | 4/29/86 | 4/29/86 | 4/29/86 |

ND - Not Detected

* At normal background levels

Table 2. 625 QC

| Sample ID#: | Method Blank | 906201 Duplicate |
|---|---|---|
| **Priority Pollutants** | Concentration (μg/L) | |
| Bis(2-ethylhexyl)phthalate | 15 | 38* |
| All Other Priority Pollutants | ND | ND |
| Detection Limit | 2 | 2 |
| **Surrogate Recoveries** | Percent (%) | |
| 2-Fluorophenol | 40 | 38 |
| Phenol-$d_5$ | 30 | 28 |
| Nitrobenzene-$d_5$ | 63 | 64 |
| 2-Fluorobiphenyl | 51 | 53 |
| 2,4,6-Tribromophenol | 48 | 59 |
| Terphenyl-$d_{14}$ | 67 | 78 |
| Extraction Date: | 4/22/86 | 4/22/86 |
| Analysis Date: | 4/29/86 | 4/29/86 |

ND - Not Detected

* At normal background levels

# CHEMICAL ANALYSIS OF SOIL SAMPLES

RECEIVED
MAY 14 1986
AeroVironment Inc.

MAY 9, 1986

FOR

CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY

ACUREX CORPORATION
485 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

**ACUREX Corporation**

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

May 9, 1986
Acurex ID#: 8604-044BB


Attention: Chris Lovedahl

Subject: Analysis of Composite of Two Soils, Received 4/18/86

Soil samples 906125 and 906126 were composited on an equal basis and analyzed for eight metals by rigorous digestion with nitric acid followed by atomic absorption spectrophotometry. The composite was also analyzed for EP toxicity metals by leaching the soil with an acetic acid solution per EPA Method 1310. The leachate was then digested with nitric acid followed by atomic absorption spectrophotometry. Results are presented in Table 1, QC results in Table 2.

Prepared by: Patrick M. Hirata, Chemist

Approved by: Greg Nicoll, Manager, Inorganic Chemistry

PMH/GN/esl

These results were obtained by following standard laboratory procedures; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

Table 1. Eight Metals Results for Composite of 906125 and 906126

| Sample ID: | Date Received | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| Total | 4/18/86 | <0.2 | 100 | 4.0 | 340 | 2100 | <0.05 | <0.2 | 0.6 | µg/g |
| Leachate | 4/18/86 | <10 | 480 | 30 | 20 | 260 | <1 | <10 | <10 | µg/L |
| Analysis Date: | | 5/7/86 | 5/5/86 | 5/5/86 | 5/7/86 | 5/7/86 | 5/5/86 | 5/6/86 | 5/7/86 | |

Table 2. Eight Metals QC for Composite of 906125 and 906126

| Sample ID: | Date Received | Arsenic | Barium | Cadmium | Chromium | Lead | Mercury | Selenium | Silver | Units |
|---|---|---|---|---|---|---|---|---|---|---|
| Total Method Blank | -- | <0.2 | <1 | <0.2 | <0.2 | <0.4 | <0.05 | <0.2 | <0.2 | µg/g |
| Leachate Method Blank | -- | <10 | <50 | <10 | <10 | <20 | <1 | <10 | <10 | µg/L |
| Total duplicate | 4/18/86 | <0.2 | 100 | 3.4 | 240 | 1400 | <0.05 | <0.2 | 0.6 | µg/g |
| Leachate duplicate | 4/18/86 | <10 | 610 | 30 | 20 | 400 | <1 | <10 | <10 | µg/L |
| Analysis Date | | 5/7/86 | 5/5/86 | 5/7/86 | 5/7/86 | 5/7/86 | 5/5/86 | 5/6/86 | 5/7/86 | |

1l·55i

CHEMICAL ANALYSIS OF WATER SAMPLES

RECEIVED
MAY 16 1986
Aerovironment Inc.

MAY 13, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
485 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

ACUREX Corporation

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

May 13, 1986
Acurex ID#: 8604-039G
8604-041G
8604-044G



Attention: Chris Lovedahl

Subject: Analysis of Seven Waters Received 4/17/86, Eight Waters Received 4/18/86, and One Water Received 4/18/86

The above samples were analyzed for herbicides following Method 509B (Standard Methods for the Examination of Water and Wastewater, 16th edition) by Brown and Caldwell Laboratories. A 6-foot 1.5% SP-2250/1.95% SP-2401 was used as the primary column. Samples for herbicide analysis were extracted with diethyl ether and the extract hydrolyzed. The herbicide acids were methylated and then injected into a gas chromatographic system operated isothermally. An electron capture detector was employed for detection of the herbicides. Eight samples missed their extraction holding times by two days due to laboratory backlog. At your direction, these samples were extracted and analyzed. Results of the 509B analyses are presented in Table 1 with QC results in Table 2.

Submitted by: Greg Nicoll
Greg Nicoll
Manager, Inorganic Chemistry

Viorica Lopez-Avila
Viorica Lopez-Avila, Ph.D.
Technical Director

GN/VLA/esl

These results were obtained using accepted laboratory practices; the liability of Acurex Corporation shall not exceed the amount paid for this report. In no event shall Acurex be liable for special or consequential damages.

555 Clyde Avenue PO Box 7555 Mountain View CA 94039 (415) 964-3200 Telex 34-6391 TWX 910-7796593

Table 1. 509B Results

| Sample ID | Extraction Date | Analysis Date | Concentration, µg/L 2,4-D | 2,4,5-T | Silvex |
|---|---|---|---|---|---|
| 906037 | 4/22/86 | 5/1/86 | <0.06 | <0.06 | <0.06 |
| 906042 | 4/22/86 | 5/1/86 | <0.06 | <0.06 | <0.06 |
| 906047 | 4/22/86 | 5/1/86 | <0.06 | <0.06 | <0.06 |
| 906048 | 4/22/86 | 5/1/86 | <0.06 | <0.06 | <0.06 |
| 906089 | 4/22/86 | 5/1/86 | <0.06 | <0.06 | <0.06 |
| 906095 | 4/22/86 | 5/1/86 | <0.06 | <0.06 | <0.06 |
| 906100 | 4/22/86 | 5/1/86 | <0.06 | <0.06 | <0.06 |
| 906130 | 4/25/86 | 5/5/86 | 0.09 | <0.06 | <0.06 |
| 906102 | 4/25/86 | 5/5/86 | <0.06 | <0.06 | 0.07 |
| 906137 | 4/25/86 | 5/5/86 | 0.08 | <0.06 | <0.06 |
| 906142 | 4/25/86 | 5/5/86 | 0.09 | <0.06 | <0.06 |
| 906149 | 4/25/86 | 5/5/86 | 0.08 | <0.06 | <0.06 |
| 906171 | 4/25/86 | 5/5/86 | 0.07 | <0.06 | <0.06 |
| 906244 | 4/25/86 | 5/5/86 | 0.07 | <0.06 | <0.06 |
| 906249 | 4/25/86 | 5/5/86 | <0.06 | <0.06 | 0.10 |
| 906220 | 4/25/86 | 5/12/86 | <0.06 | <0.06 | <0.06 |

Table 2. 509B QC

| Sample ID | Extraction Date | Analysis Date | Concentration, μg/L | | |
|---|---|---|---|---|---|
| | | | 2,4-D | 2,4,5-T | Silvex |
| Method Blank | 4/22/86 | 5/1/86 | <0.06 | <0.06 | <0.06 |
| Method Blank | 4/25/86 | 5/5/86 | <0.06 | <0.06 | <0.06 |
| Method Blank | 4/25/86 | 5/12/86 | <0.06 | <0.06 | <0.06 |
| 906100 Duplicate | 4/22/86 | 5/1/86 | <0.06 | <0.06 | <0.06 |
| 906102 Duplicate | 4/25/86 | 5/5/86 | <0.06 | <0.06 | 0.09 |
| 906102 Spike | 4/25/86 | 5/12/86 | 74% R | 61% R | 95% R |
| Spike Level | | | 1.07 | 0.21 | 0.21 |

R - Recovery

# CHEMICAL ANALYSIS OF WATER AND SOIL SAMPLES

MAY 19, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
485 CLYDE AVENUE
MOUNTAIN VIEW, CA 94039

ACUREX Corporation

ACUREX Corporation

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

May 19, 1986
Acurex ID#: 8604-037F
8604-039F
8604-041F
8604-044F



Attention: Chris Lovedahl

Subject: Analysis of Five Waters Received 4/16/86,
Eight Waters Received 4/17/86,
Thirteen Waters and Seven Soils Received 4/18/86,
And Eighteen Waters Received 4/18/86

Samples were analyzed for oil and grease by extracting waters or sonicating soils with freon (EPA Method 3550) and then analyzing the solvent by infrared spectroscopy using EPA Method 413.2. Petroleum hydrocarbons were determined on selected samples by passing the freon extract of the sample across silica gel and analyzing the resulting solvent by infrared spectroscopy using EPA Method 418.1. Results are presented in Table 1 with QC results in Table 2. Results are not blank corrected.

Prepared by: J. Romeo M. Milanes
Staff Chemist

Approved by: Greg Nicoll
Manager, Inorganic Chemistry

JRMM GN/esl

... using accepted laboratory practices; the liability ... not exceed the amount paid for this report. ... liable for special or consequential damages.

Table 1. Water Oil & Grease and Petroleum Hydrocarbons Results

| | | Oil and Grease | | Petroleum Hydrocarbons | |
|---|---|---|---|---|---|
| Sample ID | Prepared Batch | Concentration, mg/L | Analysis Completed | Concentration, mg/L | Analysis Completed |
| 906056 | A | 2.1 | 5/8/86 | NA | NA |
| 906057 | A | 2.2 | 5/8/86 | NA | NA |
| 906061 | A | 0.4* | 5/8/86 | 0.3* | 5/12/86 |
| 906065 | A | 3.4 | 5/12/86 | 2.4 | 5/12/86 |
| 906070 | A | 1.7 | 5/8/86 | 1.1 | 5/12/86 |
| 906039 | A | 1.9 | 5/8/86 | NA | NA |
| 906044 | A | 1.3 | 5/8/86 | NA | NA |
| 906074 | A | 0.7 | 5/8/86 | 0.7 | 5/12/86 |
| 906080 | A | 0.9 | 5/8/86 | 0.5 | 5/12/86 |
| 906084 | A | 1.7 | 5/8/86 | NA | NA |
| 906086 | A | 0.6 | 5/8/86 | NA | NA |
| 906090 | A | 0.8 | 5/8/86 | NA | NA |
| 906097 | A | 0.7 | 5/8/86 | NA | NA |
| 906128 | B | 0.5* | 5/8/86 | NA | NA |
| 906132 | B | 1.5 | 5/8/86 | NA | NA |
| 906135 | B | 1.5 | 5/8/86 | NA | NA |
| 906140 | B | 0.9* | 5/8/86 | NA | NA |
| 906146 | B | 2.9 | 5/8/86 | NA | NA |
| 906153 | B | 0.9* | 5/8/86 | NA | NA |
| 906158 | B | 1.5 | 5/8/86 | 1.3 | 5/12/86 |
| 906161 | B | 7.2 | 5/8/86 | NA | NA |
| 906163 | B | 17 | 5/8/86 | NA | NA |
| 906172 | B | 1.9 | 5/8/86 | NA | NA |
| 906242 | B | 2.0 | 5/8/86 | NA | NA |
| 906247 | B | 4.6 | 5/8/86 | NA | NA |
| 906251 | B | 8.4 | 5/8/86 | NA | NA |
| 906116 | C | 4.9 | 5/9/86 | NA | NA |
| 906175 | C | 0.5 | 5/9/86 | 0.5 | 5/9/86 |
| 906178 | C | 1.1 | 5/9/86 | NA | NA |
| 906182 | C | 18,000 | 5/9/86 | NA | NA |
| 906186 | C | 170 | 5/9/86 | NA | NA |
| 906190 | C | 11 | 5/9/86 | NA | NA |

* - Below method blank
NA - Not analyzed

Table 1. Water Oil & Grease and Petroleum Hydrocarbons Results (Concluded)

| | | Oil and Grease | | Petroleum Hydrocarbons | |
|---|---|---|---|---|---|
| Sample ID | Prepared Batch | Concentration, mg/L | Analysis Completed | Concentration, mg/L | Analysis Completed |
| 906194 | C | 4.8 | 5/9/86 | NA | NA |
| 906200 | C | 4.3 | 5/9/86 | NA | NA |
| 906204 | C | 2.8 | 5/9/86 | NA | NA |
| 906208 | C | 8.5 | 5/9/86 | NA | NA |
| 906214 | C | 2.7 | 5/9/86 | NA | NA |
| 906218 | C | 1.1 | 5/9/86 | NA | NA |
| BP2-G2 | C | 0.9 | 5/9/86 | NA | NA |
| BP3-G2 | C | 1.4 | 5/9/86 | NA | NA |
| BP4-G2 | C | <0.1 | 5/9/86 | NA | NA |
| BP5-G2 | C | <0.1 | 5/9/86 | NA | NA |
| BP6-G2 | C | <0.1 | 5/9/86 | NA | NA |
| BP9-G2 | C | 0.5 | 5/9/86 | NA | NA |

NA - Not analyzed

Table 2. Soil Oil & Grease and Petroleum Hydrocarbons Results

| | Oil and Grease | | Petroleum Hydrocarbons | |
|---|---|---|---|---|
| Sample ID | Concentration, μg/g | Analysis Completed | Concentration, μg/g | Analysis Completed |
| 906103 | <100 | 5/13/86 | <100 | 5/13/86 |
| 906104 | 1600 | 5/13/86 | 1600 | 5/13/86 |
| 906105 | 4000 | 5/13/86 | 4700 | 5/13/86 |
| 906108 | 600 | 5/13/86 | 600 | 5/13/86 |
| 906121 | 500 | 5/13/86 | 500 | 5/13/86 |
| 906122 | 200 | 5/13/86 | 200 | 5/13/86 |
| 906123 | <100 | 5/13/86 | <100 | 5/13/86 |

Table 3. Water Oil & Grease and Petroleum Hydrocarbons QC*

| | | Oil and Grease | | Petroleum Hydrocarbons | |
|---|---|---|---|---|---|
| Sample ID | Prepared Batch | Concentration, mg/L | Analysis Completed | Concentration, mg/L | Analysis Completed |
| Method Blank | A | 0.6 | 5/8/86 | 0.5 | 5/12/86 |
| Method Blank | B | 1.0 | 5/8/86 | 0.8 | 5/12/86 |
| Method Blank | C | <0.1 | 5/9/86 | <0.1 | 5/9/86 |
| 906158 duplicate | B | 8.3 | 5/12/86 | 5.2 | 5/12/86 |

* Only one sample aliquot taken in the field for water QC

Table 4. Soil Oil & Grease and Petroleum Hydrocarbons QC

| | Oil and Grease | | Petroleum Hydrocarbons | |
|---|---|---|---|---|
| Sample ID | Concentration, µg/g | Analysis Completed | Concentration, µg/g | Analysis Completed |
| Method blank | <100 | 5/13/86 | <100 | 5/13/86 |
| 906108 duplicate | 1300 | 5/13/86 | 1200 | 5/13/86 |
| 906108 duplicate #2 | <100 | 5/16/86 | <100 | 5/16/86 |
| 906104 duplicate | 1400 | 5/16/86 | 1200 | 5/16/86 |
| 906104 spike | 48% R* | 5/16/86 | 95% R | 5/16/86 |
| Spiked blank | 95% R | 5/16/86 | -- | -- |
| Spike level | 420 | 5/16/86 | 420 | 5/16/86 |

R - Recovery
* - Average of two spikes (2600 and 800 µg/g) - Sample not homogenous

RECEIVED
MAY 30 1986
AeroVironment Inc.

# CHEMICAL ANALYSIS OF WATER AND SOIL SAMPLES

MAY 22, 1986

FOR
CHRIS LOVEDAHL
AEROVIRONMENT, INC.
825 MYRTLE AVENUE
MONROVIA, CA 91016

BY
ACUREX CORPORATION
485 CLYDE AVENUE
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ACUREX Corporation

**ACUREX Corporation**

Energy & Environmental Division

AeroVironment, Inc.
825 Myrtle Avenue
Monrovia, CA 91016

May 22, 1986
Acurex ID#: 8604-037E
8604-039E
8604-041E
8601-044E



Attention: Chris Lovedahl

Subject: Analysis of Four Waters Received 4/16/86,
Eight Waters Received 4/17/86,
Thirteen Waters and Seven Soils Received 4/18/86,
and Eighteen Waters Received 4/18/86

Selected samples were analyzed following EPA Method 601 for waters and Method 8010 for soils using 1% SP-1000 on Carbopack B as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample or 5 g of soil sample dispersed in 5 mL of reagent water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a Hall detector.

Results are presented in Tables 1 and 2 including recoveries of dibromomethane which was employed as a surrogate. QC results for Method 601 and Method 8010 are presented in Tables 5 and 6.

Selected samples were analyzed following EPA Method 602 for waters and Method 8020 for soils using 5% SP-1200/1.75% Bentone 34 as the primary column. The method can be summarized as follows:

> Helium is bubbled through 5 mL of water sample or 5 g of soil sample dispersed in 5 mL of reagent water contained in a specially designed purging chamber at ambient temperature. The purgeable halogenated organic compounds are efficiently transferred from the aqueous phase to the vapor phase. The vapor is swept through a sorbent column where the purgeables are trapped. After purging is completed, the sorbent column is heated and back flushed with helium to desorb the purgeables onto a gas chromatographic column. The gas chromatograph is temperature programmed to separate the purgeables which are then detected with a PID detector.

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Results are presented in Tables 3 and 4, including recoveries of bromofluorobenzene which was employed as a surrogate. QC results for Method 602 and Method 8020 are presented in Tables 7 and 8.

Submitted by: Greg Nicoll
Greg Nicoll
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Technical Director

GN/VLA/ats

Table 1. 601 Results

| Sample ID: | 906055 | 906060 | 906064 | 906069 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | ND | ND | ND | 0.8* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | 1.1 (1.3)[c] | ND | ND | 0.2 |
| Chloroform | ND | ND | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | 100 (110)[c] | 0.2 | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 72 | 69 | 85 | 117 |
| Analysis Date | 4/17/86 | 4/17/86 | 4/17/86 | 4/17/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
c - Confirmed by GC/MS at level in parenthesis using EPA Method 624 and SP-1000 column.
ND - Not detected

Table 1. 601 Results
(Continued)

| Sample ID: | 906038 | 906043 | 906073 | 906079 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.6* | 0.6* | 1.0* | 2.0* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | 0.8 |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | 0.7 | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 57 | 62 | 70 | 76 |
| Analysis Date | 4/18/86 | 4/18/86 | 4/18/86 | 4/18/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
ND - Not detected

Table 1. 601 Results
(Continued)

| Sample ID: | 906083 | 906085 | 906091 | 906096 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 1.0* | 1.5* | 6.8* | 2.2* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | ND | ND | 0.7 | 1.5 |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 70 | 56 | 75 | 78 |
| Analysis Date | 4/18/86 | 4/18/86 | 4/21/86 | 4/21/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
ND - Not detected

Table 1. 601 Results
(Continued)

| Sample ID: | 906127 | 906134 | 906139 | 906144 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.8* | 0.6* | 0.3* | 0.4* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | 0.5 | ND | 0.5 | ND |
| Chloroform | 0.4 | 0.3 | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | 26 (24)[c] | ND | 28 (29)[c] | 29 (32)[c] |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | 1.0 | ND | 1.1 | 1.2 |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 68 | 66 | 75 | 76 |
| Analysis Date | 4/21/86 | 4/21/86 | 4/21/86 | 4/21/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
c - Confirmed by GC/MS at level in parenthesis using EPA Method 624
and SP-1000 column.
ND - Not detected

Table 1. 601 Results
(Continued)

| Sample ID: | 906145 | 906150 | 906152 | 906157 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | ND | ND | ND | ND |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | 0.7 | ND | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 94 | 80 | 78 | 99 |
| Analysis Date | 4/23/86 | 4/23/86 | 4/23/86 | 4/23/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 [illegible]
a - These compounds coelute
b - These compounds coelute
ND - Not detected

AD-A183 482 INSTALLATION RESTORATION PROGRAM PHASE 2 CONFIRMATION/QUANTIFICATION STAG..(U) AEROVIRONMENT INC MONROVIA CA R BAUER MAY 87 AV-FR-86/517R2 7/8

UNCLASSIFIED F33615-83-D-4000 F/G 24/4 NL

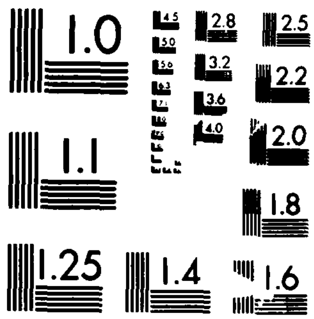


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Table 1. 601 Results
(Continued)

| Sample ID: | 906160 | 906164 | 906170 | 906241 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | ND | ND | ND | ND |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | 0.1 |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | ND | ND |
| Dibromochloromethane[a] | | | | |
| 1,1,2-Trichloroethane[a] | ND | ND | ND | ND |
| cis-1,3-Dichloropropene[a] | | | | |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 81 | 90 | 88 | 86 |
| Analysis Date | 4/23/86 | 4/23/86 | 4/23/86 | 4/23/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
ND - Not detected

Table 1. 601 Results
(Continued)

| Sample ID: | 906246 | 906203 | 906207 | 906213 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | ND | 0.5* | 0.2* | 0.3* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | 11 (12)[c] | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | 0.09 | ND | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | 58 (76)[c] | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 90 | 76 | 91 | 55 |
| Analysis Date | 4/23/86 | 4/24/86 | 4/23/86 | 4/24/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
c - Confirmed by GC/MS at level in parenthesis using EPA Method 624 and SP-1000 column.
ND - Not detected

Table 1. 601 Results
(Continued)

| Sample ID: | 906217 | BP2-G2 | BP3-G2 | BP4-G2 |
|---|---|---|---|---|
| Compound | Concentration μg/L | | | |
| Chloromethane | ND | 21 (51)[c] | ND | ND |
| Bromomethane | ND | 16 (16)[c] | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.2* | 0.2* | 1.6* | 1.8* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | ND | 0.6 (2.4)[c] | 0.03 | 0.02 |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | 1.4 (2.9)[c] | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | 1.1 (2.7)[c,d] | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 83 | 82 | 58 | 73 |
| Analysis Date | 4/23/86 | 4/24/86 | 4/24/86 | 4/24/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 μg/L.
a - These compounds coelute
b - These compounds coelute
c - Confirmed by GC/MS at level in parenthesis using EPA Method 624 and SP-1000 column.
d - Dibromochloromethane confirmed by GC/MS.
ND - Not detected

Table 1. 601 Results
(Continued)

| Sample ID: | BP5-G2 | BP6-G2 | BP9-G2 | 906115 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | ND | ND | 2.1* | 0.3* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | 0.2 | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 79 | 79 | 56 | 88 |
| Analysis Date | 4/24/86 | 4/24/86 | 4/24/86 | 4/23/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
ND - Not detected

Table 1. 601 Results
(Continued)

| Sample ID: | 906174 | 906177 | 906181** | 906185 |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.6* | 1.3* | <5[c] | 0.2* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | 0.1 | ND | 1.1 (0.8)[d] |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 75 | 60 | 71 | 97 |
| Analysis Date | 4/24/86 | 4/24/86 | 4/24/86 | 4/23/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
** - Detection limit increased by a factor of ten - oily sample.
a - These compounds coelute
b - These compounds coelute
c - GC/MS confirmation using EPA Method 624 and SP-1000 column gave <5 µg/L. GC analysis gave 760 µg/L.
d - Confirmed by GC/MS at level in parenthesis using EPA Method 624 and SP-1000 column.
ND - Not detected

Table 1. 601 Results
(Concluded)

| Sample ID: | 906189 | 906193 | 906199 | Detection Limit |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | 0.08 |
| Bromomethane | ND | ND | ND | 1 |
| Dichlorodifluoromethane | ND | ND | ND | 2 |
| Vinyl chloride | ND | ND | ND | 0.2 |
| Chloroethane | ND | ND | ND | 0.5 |
| Methylene chloride | 0.2* | 0.2* | 0.3* | 0.2 |
| Trichlorofluoromethane | ND | ND | ND | 1 |
| 1,1-Dichloroethene | ND | ND | ND | 0.1 |
| 1,1-Dichloroethane | ND | ND | ND | 0.07 |
| trans-1,2-Dichloroethene | ND | ND | ND | 0.1 |
| Chloroform | ND | ND | ND | 0.05 |
| 1,2-Dichloroethane | ND | ND | ND | 0.03 |
| 1,1,1-Trichloroethane | ND | ND | ND | 0.03 |
| Carbon tetrachloride | ND | ND | ND | 0.1 |
| Bromodichloromethane | ND | ND | ND | 0.1 |
| 1,2-Dichloropropane | ND | ND | ND | 0.04 |
| trans-1,3-Dichloropropene | ND | ND | ND | 0.3 |
| Trichloroethene | ND | ND | ND | 0.1 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropene[a] | ND | ND | ND | 0.2 |
| Chloroethylvinyl ether | ND | ND | ND | 0.1 |
| Bromoform | ND | ND | ND | 0.2 |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | 0.3 |
| Chlorobenzene | ND | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | ND | 0.3 |
| Surrogate Recovery, % | 95 | 95 | 87 | |
| Analysis Date | 4/23/86 | 4/23/86 | 4/23/86 | |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
ND - Not detected

Table 2. 8010 Results

| Sample ID: | 906103 | 906104 | 906105 | 906108 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 0.0031* | 0.0021* | 0.0093* | 0.0017* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | 0.0006 | 0.0029 | ND |
| Chloroform | ND | 0.0002 | 0.0006 | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | 0.0003 | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 55 | 53 | 50 | 35 |
| Analysis Date | 4/25/86 | 4/25/86 | 4/25/86 | 4/25/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
ND - Not detected

Table 2. 8010 Results
(Concluded)

| Sample ID: | 906121 | 906122 | 906123 | Detection Limit |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Chloromethane | ND | ND | ND | 0.00008 |
| Bromomethane | ND | ND | ND | 0.001 |
| Dichlorodifluoromethane | ND | ND | ND | 0.002 |
| Vinyl chloride | ND | ND | ND | 0.0002 |
| Chloroethane | ND | ND | ND | 0.0005 |
| Methylene chloride | 0.0009* | 0.0009* | 0.0014* | 0.0002 |
| Trichlorofluoromethane | ND | ND | ND | |
| 1,1-Dichloroethene | ND | ND | ND | 0.0001 |
| 1,1-Dichloroethane | ND | ND | ND | 0.00007 |
| trans-1,2-Dichloroethene | ND | ND | ND | 0.0001 |
| Chloroform | ND | 0.00009 | ND | 0.00005 |
| 1,2-Dichloroethane | ND | ND | ND | 0.00003 |
| 1,1,1-Trichloroethane | ND | ND | ND | 0.00003 |
| Carbon tetrachloride | ND | ND | ND | 0.0001 |
| Bromodichloromethane | ND | ND | ND | 0.0001 |
| 1,2-Dichloropropane | ND | ND | ND | 0.00004 |
| trans-1,3-Dichloropropene | ND | ND | ND | 0.0003 |
| Trichloroethene | ND | ND | ND | 0.0001 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | 0.0002 |
| Chloroethylvinyl ether | ND | ND | ND | 0.0001 |
| Bromoform | ND | ND | ND | 0.0002 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | 0.0003 |
| Chlorobenzene | ND | ND | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | ND | 0.0003 |
| Surrogate Recovery, % | 66 | 49 | 62 | |
| Analysis Date | 4/25/86 | 4/25/86 | 4/25/86 | |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
ND - Not detected

Table 3. 602 Results

| Sample ID#: | 906055 | 906060 | 906064 | 906069 | 906038 |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/17/86 | 4/17/86 | 4/17/86 | 4/17/86 | 4/17/86 |
| % Surrogate Recovery | 97 | 100 | 101 | 100 | 105 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not detected

Table 3. 602 Results
(Continued)

| Sample ID#: | 906043 | 906073 | 906079 | 906083 | 906085 |
|---|---|---|---|---|---|
| Compound | Concentration μg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/17/86 | 4/17/86 | 4/17/86 | 4/17/86 | 4/18/86 |
| % Surrogate Recovery | 104 | 102 | 104 | 108 | 96 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not detected

Table 3. 602 Results
(Continued)

| Sample ID#: | 906091 | 906096 | 906127 | 906134 | 906139 |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/18/86 | 4/18/86 | 4/21/86 | 4/21/86 | 4/21/86 |
| % Surrogate Recovery | 94 | 94 | 93 | 93 | 93 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not detected

Table 3. 602 Results
(Continued)

| Sample ID#: | 906144 | 906145 | 906150 | 906152 | 906157 |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | 0.3 | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/21/86 | 4/21/86 | 4/21/86 | 4/21/86 | 4/21/86 |
| % Surrogate Recovery | 95 | 96 | 92 | 84 | 93 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not detected

Table 3. 602 Results
(Continued)

| Sample ID#: | 906160 | 906164 | 906170 | 906241 | 906246 |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/21/86 | 4/21/86 | 4/21/86 | 4/21/86 | 4/21/86 |
| % Surrogate Recovery | 97 | 98 | 94 | 100 | 89 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not detected

Table 3. 602 Results
(Continued)

| Sample ID#: | 906115 | 906174 | 906177 | 906181 | 906185 |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | 9.8 | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/22/86 | 4/22/86 | 4/23/86 | 4/24/86 | 4/21/86 |
| % Surrogate Recovery | 85 | 93 | 95 | 148[3] | 73 |

[1] Chlorobenzene and meta-xylene
[2] Ortho-xylene and para-xylene
[3] Matrix interference
ND - Not detected

Table 3. 602 Results
(Continued)

| Sample ID#: | 906189 | 906193 | 906199 | 906203 | 906207 |
|---|---|---|---|---|---|
| Compound | Concentration μg/L | | | | |
| Benzene | ND | ND | 0.9 (1.0)[3] | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/21/86 | 4/21/86 | 4/21/86 | 4/22/86 | 4/22/86 |
| % Surrogate Recovery | 62 | 59 | 55 | 92 | 84 |

1 Chiorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

3 Confirmed by GC/MS at level in parenthesis using EPA method 624 and SP-1000 column

ND - Not detected

Table 3. 602 Results
(Continued)

| Sample ID#: | 906213 | 906217 | BP2-G2 | BP3-G2 | BP4-G2 |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/24/86 | 4/22/86 | 4/22/86 | 4/22/86 | 4/24/86 |
| % Surrogate Recovery | 96 | 90 | 145 | 104 | 98 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not detected

Table 3. 602 Results
(Concluded)

| Sample ID#: | BP5-G2 | BP6-G2 | BP9-G2 | Detection Limit |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Benzene | ND | ND | ND | 0.2 |
| Toluene | ND | ND | ND | 0.2 |
| Ethylbenzene | 0.9 | 0.9 | 0.9 | 0.2 |
| Chlorobenzene[1] | ND | ND | ND | 0.2 |
| Xylenes[2] | ND | ND | ND | 0.2 |
| Dichlorobenzenes | ND | ND | ND | 0.4 |
| Analysis Date: | 4/24/86 | 4/24/86 | 4/24/86 | |
| % Surrogate Recovery | 101 | 108 | 107 | |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not detected

Table 4. 8020 Results

| Sample ID#: | 906103 | 906104[3] | 906105[4] | 906108 |
|---|---|---|---|---|
| Compound | Concentration µg/g | | | |
| Benzene | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND |
| Xylenes[2] | 0.0046 | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Analysis Date: | 4/25/86 | 5/1/86 | 5/1/86 | 5/2/86 |
| % Surrogate Recovery | 94 | 104 | 159 | 53 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

[3] Detection limit raised by a factor of 1000 due to matrix interferences.

[4] Detection limit raised by a factor of 250 due to matrix interferences.

ND - Not detected

Table 4. 8020 Results
(Concluded)

| Sample ID#: | 906121 | 906122 | 906123 | Detection Limit |
|---|---|---|---|---|
| Compound | Concentration μg/g | | | |
| Benzene | ND | ND | ND | 0.0002 |
| Toluene | ND | ND | ND | 0.0002 |
| Ethylbenzene | ND | ND | ND | 0.0002 |
| Chlorobenzene[1] | ND | ND | ND | 0.0002 |
| Xylenes[2] | ND | ND | ND | 0.0002 |
| Dichlorobenzenes | ND | ND | ND | 0.0004 |
| Analysis Date: | 4/30/86 | 4/30/86 | 4/30/86 | |
| % Surrogate Recovery | 36 | 83 | 95 | |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not detected

Table 5. 601 QC

| Sample ID: | Method Blank | Method Blank | Method Blank | Method Blank |
|---|---|---|---|---|
| Compound | Concentration μg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 1.1 | 1.2 | 0.7 | 1.2 |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | 0.3 | ND | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | NS | NS | NS | NS |
| Analysis Date | 4/17/86 | 4/18/86 | 4/18/86 | 4/21/86 |

a - These compounds coelute
b - These compounds coelute
ND - Not detected
NS - Not spiked

Table 5. 601 QC

| Sample ID: | Method Blank | Method Blank | Method Blank | Storage Blank |
|---|---|---|---|---|
| Compound | Concentration µg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | ND | 2.0 | 4.8 | 1.0 |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND | ND |
| Chloroform | ND | ND | ND | 0.4 |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | ND | ND | ND |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | NS | NS | NS | 88 |
| Analysis Date | 4/21/86 | 4/23/86 | 4/24/86 | 4/17/86 |

a - These compounds coelute
b - These compounds coelute
ND - Not detected
NS - Not spiked

Table 5. 601 QC

| Sample ID: | Storage Blank | Storage Blank | 906055 Duplicate | 906079 Duplicate |
|---|---|---|---|---|
| Compound | Concentration μg/L | | | |
| Chloromethane | ND | ND | ND | ND |
| Bromomethane | ND | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND | ND |
| Vinyl chloride | ND | ND | ND | ND |
| Chloroethane | ND | ND | ND | ND |
| Methylene chloride | 2.8 | 0.5 | 2.3* | 3.3* |
| Trichlorofluoromethane | ND | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | 1.7[c] | ND |
| Chloroform | 0.4 | ND | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND | 0.9 |
| Bromodichloromethane | ND | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND | ND |
| Trichloroethene | ND | 0.1 | 90[c] | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND | ND |
| Chlorobenzene | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND |
| Surrogate Recovery, % | 73 | 80 | 66 | 79 |
| Analysis Date | 4/21/86 | 4/23/86 | 4/18/86 | 4/18/86 |

* - Typical laboratory background levels for methylene chloride at 1-5 μg/L.
a - These compounds coelute
b - These compounds coelute
c - Confirmed by GC/MS - see sample result.
ND - Not detected

Table 5. 601 QC
(Concluded)

| Sample ID#: | 906181** Duplicate | BP2-G2 Duplicate | 906091 % Recovery (Spike Level 5 μg/L) | BP3-G2 % Recovery (Spike Level 5 μg/L) |
|---|---|---|---|---|
| Compound | Concentration μg/L | | | |
| Chloromethane | ND | 14[c] | 93 | 66 |
| Bromomethane | ND | 12[c] | 147 | 58 |
| Dichlorodifluoromethane | ND | ND | 145 | 58 |
| Vinyl chloride | ND | ND | 145 | 58 |
| Chloroethane | ND | ND | 80 | 81 |
| Methylene chloride | 160[c] | 3.0* | 80 | 74 |
| Trichlorofluoromethane | ND | ND | 92 | 84 |
| 1,1-Dichloroethene | ND | ND | 95 | 74 |
| 1,1-Dichloroethane | ND | ND | 96 | 91 |
| trans-1,2-Dichloroethene | ND | ND | 98 | 94 |
| Chloroform | ND | 0.7 | 104 | 75 |
| 1,2-Dichloroethane | ND | ND | 102 | 96 |
| 1,1,1-Trichloroethane | ND | ND | 97 | 98 |
| Carbon tetrachloride | ND | ND | 99 | 90 |
| Bromodichloromethane | ND | 2.1 | 85 | 99 |
| 1,2-Dichloropropane | ND | ND | 98 | 84 |
| trans-1,3-Dichloropropane | ND | ND | 94 | 88 |
| Trichloroethene | ND | ND | 94 | 80 |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropane[a] | ND | 2.8 | 88 | 86 |
| Chloroethylvinyl ether | ND | ND | ND | ND |
| Bromoform | ND | 2.6 | 97 | 78 |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | 100 | 73 |
| Chlorobenzene | ND | ND | 96 | 65 |
| Dichlorobenzenes | ND | ND | 106 | 82 |
| Surrogate Recovery, % | 65 | 65 | 97 | NS |
| Analysis Date: | 4/24/86 | 4/24/86 | 4/21/86 | 4/24/86 |

* - Typical laboratory background levels for methylene chloride at 1-5 μg/L.
a - These compounds coelute
b - These compounds coelute
c - Confirmed by GC/MS - see sample results
ND - Not detected
NS - Not spiked

Table 6. 8010 QC

| Sample ID: | Method Blank | Method Blank | Storage Blank |
|---|---|---|---|
| Compound | Concentration µg/g | | |
| Chloromethane | ND | ND | ND |
| Bromomethane | ND | ND | ND |
| Dichlorodifluoromethane | ND | ND | ND |
| Vinyl chloride | ND | ND | ND |
| Chloroethane | ND | ND | ND |
| Methylene chloride | 0.0012 | 0.0048 | 0.0016 |
| Trichlorofluoromethane | ND | ND | ND |
| 1,1-Dichloroethene | ND | ND | ND |
| 1,1-Dichloroethane | ND | ND | ND |
| trans-1,2-Dichloroethene | ND | ND | ND |
| Chloroform | ND | ND | ND |
| 1,2-Dichloroethane | ND | ND | ND |
| 1,1,1-Trichloroethane | ND | ND | ND |
| Carbon tetrachloride | ND | ND | ND |
| Bromodichloromethane | ND | ND | ND |
| 1,2-Dichloropropane | ND | ND | ND |
| trans-1,3-Dichloropropene | ND | ND | ND |
| Trichloroethene | ND | ND | ND |
| Dibromochloromethane[a]<br>1,1,2-Trichloroethane[a]<br>cis-1,3-Dichloropropene[a] | ND | ND | ND |
| Chloroethylvinyl ether | ND | ND | ND |
| Bromoform | ND | ND | ND |
| Tetrachloroethane[b]<br>Tetrachloroethene[b] | ND | ND | ND |
| Chlorobenzene | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND |
| Surrogate Recovery, % | 62 | NS | 63 |
| Analysis Date | 4/25/86 | 5/9/86 | 4/25/86 |

a - These compounds coelute
b - These compounds coelute
ND - Not detected
NS - Not spiked

Table 6. 8010 QC
(Concluded)

| Sample ID: | 906108 Duplicate | 906122 Duplicate |
|---|---|---|
| Compound | Concentration µg/g | |
| Chloromethane | ND | ND |
| Bromomethane | ND | ND |
| Dichlorodifluoromethane | ND | ND |
| Vinyl chloride | ND | ND |
| Chloroethane | ND | ND |
| Methylene chloride | 0.0036* | 0.0047* |
| Trichlorofluoromethane | ND | ND |
| 1,1-Dichloroethene | ND | ND |
| 1,1-Dichloroethane | ND | ND |
| trans-1,2-Dichloroethene | ND | ND |
| Chloroform | ND | 0.00007 |
| 1,2-Dichloroethane | ND | ND |
| 1,1,1-Trichloroethane | ND | 0.00004 |
| Carbon tetrachloride | ND | ND |
| Bromodichloromethane | ND | ND |
| 1,2-Dichloropropane | ND | ND |
| trans-1,3-Dichloropropene | ND | ND |
| Trichloroethene | 0.0002 | 0.0002 |
| Dibromochloromethane[a] 1,1,2-Trichloroethane[a] cis-1,3-Dichloropropene[a] | ND | ND |
| Chloroethylvinyl ether | ND | ND |
| Bromoform | ND | ND |
| Tetrachloroethane[b] Tetrachloroethene[b] | ND | ND |
| Chlorobenzene | ND | ND |
| Dichlorobenzenes | ND | ND |
| Surrogate Recovery, % | 65 | 67 |
| Analysis Date | 5/12/86 | 5/9/86 |

* - Typical laboratory background levels for methylene chloride are 1-5 µg/L.
a - These compounds coelute
b - These compounds coelute
ND - Not detected
NS - Not spiked

Table 7. 602 QC
(Continued)

| Sample ID#: | Method Blank | Method Blank | Method Blank | Method Blank | Method Blank |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/16/86 | 4/17/86 | 4/18/86 | 4/21/86 | 4/22/86 |
| % Surrogate Recovery | NS | NS | NS | NS | NS |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not Detected

NS - Not Spiked

Table 7. 602 QC
(Continued)

| Sample ID#: | Method Blank | Method Blank | Method Blank | Storage Blank | Storage Blank |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND |
| Analysis Date: | 4/23/86 | 4/24/86 | 4/25/86 | 4/18/86 | 4/21/86 |
| % Surrogate Recovery | NS | NS | 126 | 100 | 77 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not Detected

NS - Not Spiked

Table 7. 602 QC
(Concluded)

| Sample ID#: | Storage Blank | 906055 Duplicate | 906096 % Recovery (Spike Level 5 µg/L) | BP6-G2 % Recovery (Spike Level 5 µg/L) | WP 882[3] Check Sample % Recovery |
|---|---|---|---|---|---|
| Compound | Concentration µg/L | | | | |
| Benzene | ND | ND | 75 | 99 | NS |
| Toluene | ND | ND | 75 | 87 | NS |
| Ethylbenzene | ND | ND | 87 | 92 | NS |
| Chlorobenzene[1] | ND | ND | 84 | 144 | 120 |
| Xylenes[2] | ND | ND | 82 | 106 | 103 |
| Dichlorobenzenes | ND | ND | 81 | 90 | NS |
| Analysis Date: | 4/25/86 | 4/18/86 | 4/18/86 | 4/25/86 | 4/26/86 |
| % Surrogate Recovery | 126 | 94 | 84 | 99 | NS |

1 Chlorobenzene and meta-xylene

2 Ortho-xylene and para-xylene

3 EPA Check sample containing 10.2 µg/L m-xylene and 23.2 µg/L p- and o-xylenes

ND - Not Detected

NS - Not Spiked

Table 8. 8020 QC

| Sample ID#: | Method Blank | Method Blank | Method Blank | Method Blank | Storage Blank | 906103 Duplicate |
|---|---|---|---|---|---|---|
| Compound | Concentration µg/g | | | | | |
| Benzene | ND | ND | ND | ND | ND | ND |
| Toluene | ND | ND | ND | ND | ND | ND |
| Ethylbenzene | ND | ND | ND | ND | ND | ND |
| Chlorobenzene[1] | ND | ND | ND | ND | ND | ND |
| Xylenes[2] | ND | ND | ND | ND | ND | ND |
| Dichlorobenzenes | ND | ND | ND | ND | ND | ND |
| Analysis Date: | 4/25/86 | 4/30/86 | 5/1/86 | 5/2/86 | 4/25/86 | 4/30/86 |
| % Surrogate Recovery | 90 | NS | NS | NS | 123 | 91 |

[1] Chlorobenzene and meta-xylene

[2] Ortho-xylene and para-xylene

ND - Not detected

NS - Not spiked

# TMA
**Thermo Analytical Inc.**


*TMA/Los Angeles*
160 Taylor Street
Post Office Box 2360
Monrovia CA 91016-2360
(818) 357-3247


RECEIVED
APR 21 1986
AeroVironment Inc.

Report To
Aerovironment, Inc.
825 S. Myrtle Avenue
Monrovia, CA 91016

Work Order No: 86-04-055

Purchase Order No: 56539

Attention
Mr. Chris Lovedahl

Received: 4-10-86

Material/Sample Identity
1 Roll of Electrical Tape

Work Identification
Toluene Analysis by Leaching - Priority
Data Reported by Telecon April 11, 1986 to Mr. Lovedahl

Summary of Laboratory Report

•

One roll of vinyl electrical tape (from K-Mart) was submitted to determine if any leachable Toluene was present. Approximately 2 inches of the tape was placed in a VOA bottle and filled with deionized water so that no headspace was present. A blank was prepared also, and both were allowed to sit overnite (approximately 19 hours). The sample was analyzed by a Tekmar purge and trap unit interfaced with a Finnigan GC/MS. Toluene was not detected in the blank, but was found in the tape sample water extract at 22 ppb (µg/L).

| Analyst | Book - Page | Approved By | Date |
|---|---|---|---|
| JSC | 361 - 83 | [signature] | 17 April 1986 |

H-3204

ANALYTICAL RESEARCH LABORATORIES, INC.

160 TAYLOR STREET, P.O. BOX 2360, MONROVIA, CALIFORNIA 91016 • (818) 357-3247

Lab/Shipper Log Number 125114

RECEIVED

| Client | Work Order | P. O. Number |
|---|---|---|
| AeroVironment | 5846-01 | Verb - C. Lovedahl |

AeroVironment Inc.

| Material/Sample Identity | Rec'd | Due |
|---|---|---|
| 1 Soil Sample | 12-20-85 | 1-15-86 |

| Requested By | Sample Disposition |
|---|---|
| Name: Mr. Chris Lovedahl Phone: (818) 357-9983 | Expendable |

Report/Ship To:

Mr. Chris Lovedahl
AeroVironment
825 S. Myrtle Avenue
Monrovia, CA 91016

Nature of Work and Information Desired

Analyze Soil For EDX, HMX, & TNT

Summary of Laboratory Report

Q.C. Level 2

The soil sample was analyzed for RDX, HMS, and TNT contents. None of these three compounds were detected in the sample. The results are as follows:

| Compound | Concentration, μg/g Soil | Detection Limit, μg/g Soil |
|---|---|---|
| RDX | < 0.74 | 0.74 |
| HMX | < 1.1 | 1.1 |
| TNT | < 0.81 | 0.81 |

The sample was analyzed by HPLC according to the method described in the American Industrial Hygiene Association Journal (45(4):222-226(1984)) provided by AeroVironment.



| Analyst | Book - Page | Approved By | Date |
|---|---|---|---|
| JPE | 370 - 33 | JPE | 8 January 1985 |

Research and Development - Testing

## BEALE AFB GROUNDWATER SAMPLING FIELD DATA

| | FIRST ROUND | | | | | |
|---|---|---|---|---|---|---|
| | INITIAL | | | STABILIZED | | |
| WELL NO. | pH | COND(umho) | TEMP(C) | pH | COND(umho) | TEMP(C) |
| 01-01 | 8.5 | 425 | 21 | 7.8 | 375 | 21 |
| 02-01 | 8.7 | 600 | 18 | 7.5 | 590 | 18.5 |
| 03-01 | 8.3 | NO DATA | 20.3 | 8.5 | NO DATA | 22 |
| 03-02 | 8.8 | NO DATA | 20.5 | 8.2 | NO DATA | 19.2 |
| 03-03 | 9 | 675 | 20 | * | * | * |
| 03-04 | 8.9 | 660 | 19 | 7.7 | 670 | 19.5 |
| 03-05 | 9.5 | 670 | NO DATA | * | * | * |
| 04-01 | 7.5 | 260 | 20.5 | 7.4 | 260 | 21.5 |
| 05-01 | 9.8 | 300 | 20.8 | 8.1 | 250 | 21.3 |
| 06-01 | 7.1 | 875 | 18 | 7.2 | 840 | 17.5 |
| 06-02 | 7.5 | 260 | NO DATA | * | * | * |
| 08-01 | 9.4 | 200 | 20.7 | * | * | * |
| 10-01 | 8.1 | NO DATA | 20.8 | 8.3 | NO DATA | 21.6 |
| 11-01 | 8.2 | 375 | 20.3 | 7.7 | 370 | 21.4 |
| 13-01 | 7.2 | 940 | 19 | 7.4 | 1000 | 17 |
| 13-02 | 7.4 | 450 | 14 | * | * | * |
| 15-01 | 8.1 | 550 | 19.5 | 8.1 | 575 | 19.5 |
| 15-02 | 8.9 | 600 | 20 | 8 | 540 | 20 |
| 15-03 | 9 | 655 | 20 | 9.3 | 400 | NO DATA |
| 15-04 | 9 | 500 | 19.5 | 8.4 | 1010 | 19.5 |
| RADIAN 01 | NS | NS | NS | NS | NS | NS |
| RADIAN 02 | 7 | 690 | 18 | 7.2 | 580 | 18 |
| RADIAN 03 | 7.1 | 755 | 18.8 | 7.1 | 670 | 19.5 |
| RADIAN 04 | 7.3 | 375 | 18.8 | 7.3 | 450 | 20.5 |

| | SECOND ROUND | | | | | |
|---|---|---|---|---|---|---|
| | INITIAL | | | STABILIZED | | |
| WELL NO. | pH | COND(umho) | TEMP(C) | pH | COND(umho) | TEMP(C) |
| 01-01 | 8.9 | 369 | 20.5 | NO DATA | 333 | 21.1 |
| 02-01 | 7.4 | 425 | 17.8 | 7.4 | 424 | 17.5 |
| 03-01 | 8.3 | 700 | 21 | 8.4 | 600 | 21 |
| 03-02 | 8.2 | 725 | 21 | 8.2 | 740 | 20 |
| 03-03 | 8.3 | 600 | 21 | 8.2 | 620 | 21 |
| 03-04 | 8.2 | 500 | 20.8 | 7.9 | 300 | 20.[illegible] |
| 03-05 | 8.9 | 450 | 21 | 8.2 | 475 | 21 |
| 04-01 | 7.9 | 199 | 21.2 | 7.3 | 201 | 21.9 |
| 05-01 | 9.4 | 156 | 21.1 | 8.8 | 175 | 21.8 |
| 06-01 | 7 | 640 | 19.5 | 7.1 | 675 | 19 |
| 06-02 | 8.8 | 240 | 19 | 7.9 | 225 | 19 |
| 08-01 | 9.4 | 240 | 20.6 | 8.7 | 236 | 20.5 |
| 10-01 | 8.9 | 411 | 20.6 | 8.8 | 360 | 20.4 |
| 11-01 | 9.1 | 270 | 20.8 | 8.6 | 260 | 21.6 |
| 13-01 | 7.2 | 741 | 17.4 | 7.3 | 866 | 18.3 |
| 13-02 | 7.6 | 340 | 17.8 | 7.4 | 360 | 17.7 |
| 15-01 | NO DATA | 380 | 20.5 | NO DATA | 360 | 21 |
| 15-02 | 9.1 | 340 | 20 | 8.3 | 325 | 20.5 |
| 15-03 | 8.9 | 300 | 20 | 8.6 | 325 | 19.5 |
| 15-04 | NO DATA | NO DATA | NO DATA | 8.8 | 410 | 20.2 |
| RADIAN 01 | 11.5 | 1510 | 17.7 | 11.6 | 976 | 17.8 |
| RADIAN 02 | 4.2 | 510 | 18.7 | 5.1 | 440 | 18.9 |
| RADIAN 03 | 7.2 | 550 | 19.8 | 6.9 | 550 | 20.1 |
| RADIAN 04 | NO DATA | 290 | 18.5 | 7 | 308 | 19.5 |

* LOW-PRODUCING WELL - WAS EVACUATED DRY AND LEFT TO RECHARGE.
  NO STABILIZED DATA AVAILABLE

NS - NOT SAMPLED

**APPENDIX I**

Professional Resumes

Christopher W. Lovdahl
Environmental Chemist
Environmental Programs Division
AeroVironment Inc.

Education

B.S., Environmental Science, University of Michigan, Dearborn, 1980

Technical Specialties

Analytical Chemistry
Environmental Chemistry
Hazardous Materials Handling

Professional Experience

Mr. Lovdahl provides chemistry support to projects related to hazardous waste handling, environmental compliance and site evaluation. He has conducted three site visits as part of a large project to audit environmental compliance of 11 U.S. Air Force manufacturing plants. Besides reviewing applicable regulations for hazardous waste generation, storage and disposal, he also assessed risks from underground storage tanks and evaluated waste minimization alternatives at the plants. In a waste inventory program for a research facility in the state of Washington, he helped prepare a waste-handling manual, identified disposal alternatives and collected high concentration drum samples.

Mr. Lovdahl is a key member of AeroVironment's Installation Restoration Program project team. He is responsible for most chemistry aspects of the site characterization and sampling activities conducted. Currently, for a project involving two Air force bases in Northern California, he has prepared sample plans, coordinated laboratory functions and conducted audits on laboratory QA/QC. He also serves these same functions on projects for clients in the private sector. •

In his previous position with the Cadillac Motor Car Division of General Motors, Mr. Lovdahl was an analytical chemist responsible for analysis of water and hazardous waste samples using spectrophotometry,

atomic emission spectroscopy, GC (ECD,FID), GC/MS, ICP and HPLC. All environmental lab work was conducted according to established EPA procedures. As part of his lab position, he worked with plant personnel to assure that proper sampling methods were used for water and wastes to be analyzed in the laboratory. Before joining the laboratory staff, Mr. Lovdahl served as an associate engineer for toxic/hazardous materials management at Cadillac. In that position, he was responsible for developing, implementing and maintaining hazardous waste management programs at three manufacturing plants. This work included waste sampling, identification of hazardous waste generation, implementation of handling procedures and approval of RCRA TSD facilities used for disposal of Cadillac's wastes.

Mr. Lovdahl has also worked for Great Lakes Environmental Services, where he coordinated three large laboratory chemical disposal projects. He was also involved in plant environmental surveys that included sampling, determination of necessary analytical testing, permitting and reporting. In another phase of that project, Mr. Lovdahl evaluated client facilities for compliance with hazardous waste, wastewater and spill control regulations.

John K. Miller
Geochemist
Environmental Programs Division
AeroVironment Inc.

## Education

M.Sc., Applied Geochemistry, University of British Columbia, 1978
B.Sc., Natural Science Division, University of Akron, 1974

## Technical Specialties

Geochemical Project Design/Management
Sampling Protocols
Quality Assurance/Control

## Professional Experience

Mr. Miller recently joined AeroVironment to provide geochemical expertise in sampling protocols, quality assurance/control and data analysis for hazardous waste contamination studies. He is currently working on several Air Force Installation Restoration Program projects in California and Oregon, for which his responsibilities include drilling supervision, sampling design, data review and analysis. He will also review data generated during field programs on the quality of soil and groundwater.

Mr. Miller previously worked for Anaconda Minerals in Denver, Colorado, where he specialized in designing, executing and interpreting the findings of geochemical programs in the western U.S. and South America. These studies used his technical knowledge of geochemical dispersion and mobility of a variety of contaminants. As a Project Geochemist, Mr. Miller also designed and managed several innovative custom laboratories incorporating cost-effective quality assurance procedures. He has developed and maintained quality assurance programs to evaluate contract laboratories, thereby assuring high quality results at economical prices. Mr. Miller has studied the effects of sample size, collection method and analytical techniques in terms of quality and cost, and has developed procedures to increase both sample output and quality at reduced cost. He has used several computer-based statistical/graphics packages to aid data interpretation and is familiar with both parametric and nonparametric techniques ranging from simple descriptive statistics to advanced multivariate techniques such as factor analysis. He has extensive training in soil science and Quaternary geology.

Mr. Miller also worked for Dresser Industries in Limerick, Ireland, as a Project Geologist/Geochemist in charge of several large projects in southwest Ireland. He has designed and supervised many geochemical, geophysical and drilling projects under a wide range of environmental conditions. He has experience with many types of drill rigs ranging from small hand-held percussion drills to large reverse circulation rigs.

Timothy F. O'Gara
Hydrogeologist
Field Operations
AeroVironment Inc.

Education

B.A., Earth Science, California State University, Fullerton, 1980

Technical Specialties

Hazardous Waste Investigations
Groundwater Monitoring
Water Supply Well Design and Inspection

Professional Experience

Mr. O'Gara is a hydrogeologist in the Environmental Programs Division at AeroVironment. In this capacity, he provides key support to AV's hazardous waste projects. He has served as field team leader on site investigations for various corporate and government clients. These investigations have included installation of numerious ground water monitoring wells and continuous soil sampling to depths of 80 feet. He has been responsible for field portions of investigations at several bases in the western U.S. under an Installation Resoration Program contract for the U.S. Air Force. For these programs, he has written and implemented soil and water sampling procedures, designed and installed ground water monitoring wells, and served as the technical contact with drilling and geophysical subcontractors. He is responsible for writing those sections of reports dealing with geology and hydrogeology.

As a member of AeroVironment's hazardous waste investigation team, Mr. O'Gara has received training in EPA methods for soil and water sampling, as well as for site safety and respiratory protection.

Before joining AV, Mr. O'Gara was self-employed as a contracting hydrogeologist. During this time, he provided specialized hydrology and geology consulting to several consulting firms in Southern California. He directed drilling and soil sampling programs for numerous leaking underground storage tank investigations at facilities in the Los Angeles area. These programs were conducted in accordance with the guidelines adopted by the California Regional Water Quality Control Board. His responsibilities included insuring that proper safety, sampling protocol, and chain of custody procedures were followed throughout the investiga

tion. He was also responsible for selecting the test boring sites. In other consulting work, he provided design and on-site inspection for groundwater projects as diverse as municipal water supply wells and multiple completion piezometer networks.

In previous employment by James M. Montgomery Consulting Engineers (JMM), Mr. O'Gara served as the resident geologist at the initial closure of the Stringfellow Quarry Class I hazardous waste site. In that capacity, he supervised the placement of the subsurface containment barrier, the installation of down-gradient monitoring wells, and the monitoring of groundwater conditions during the construction. Other assignments included field inspection for extension of the Alamitos Injection Well Salinity Barrier for Orange County Water District, installation of various piezometer networks, and performance of isolated zone tests in deep wells. The latter projects helped to determine the water quality of specific aquifers within multiple aquifer systems.

Professional Memberships

National Water Well Association, Association of Ground Water Scientists and Engineers

Douglas B. Taylor, P.E.
Project Manager
Hazardous Waste Projects Group
Environmental Programs Division
AeroVironment Inc.

Education

M. Engr., Environmental Engineering, Pennsylvania State University, 1980
B.S., Environmental Engineering, Pennsylvania State University, 1979

Technical Specialties

Hazardous Waste Management
Waste Site Characterization
Wastewater Treatment

Professional Experience

Mr. Taylor serves as a key project manager in the Hazardous Waste Program for AeroVironment. In this capacity he is responsible for field activities, project planning, engineering input, schedule and budget control and team management. He is currently managing a level-of-effort Air Force contract related to the Installation Restoration Program for assessing and investigating hazardous waste at bases throughout the country. He is working on three extensive investigations of potential soil and groundwater contamination at Air Force bases in the western United States, resulting from leaking tanks and poor waste management. Mr. Taylor also manages and provides technical support to environmental audits, waste inventories. and private property site characterizations. He also serves as corporate health and safety officer.

Mr. Taylor previously worked for Ecology and Environment Inc. as the group leader for preliminary assessments and site inspections on the EPA's field investigation team contract in Denver, Colorado. As group leader, he managed routine assignments, including site inspections, sampling projects and impact assessments at over 50 sites in EPA Regions 3 and 8. He has prepared engineering reports for EPA sites including a remedial investigation plan for the McAdoo Drum site in Pennsylvania, a cost estimate report for slag isolation in Philadelphia, and a delisting analysis for a National

Priority List site in Utah. Additional specialized work included managing several geotechnical/hydrological drilling projects and drum opening activities.

Mr. Taylor also worked on a variety of water quality and hazardous waste related projects for D'Appolonia Consultants. He was the principal engineer in the investigation of a toxic waste impoundment at the Rocky Mountain Arsenal in Denver. For the Strategic Petroleum Reserve, he provided water quality studies and investigated treatment alternatives for raw water used in the expansion of salt caverns.

Registration

Professional Engineer, Colorado and California

Professional Memberships

American Society of Civil Engineers
American Water Works Association
Chi Epsilon
Water Pollution Control Federation

Sheryl Thurston
Environmental Engineer
Environmental Programs Division
AeroVironment Inc.

Education

B.S., Environmental Engineering, Northwestern University, Evanston, IL, 1985

Technical Specialties

Waste Site Evaluation
Environmental Compliance
Impact Assessment

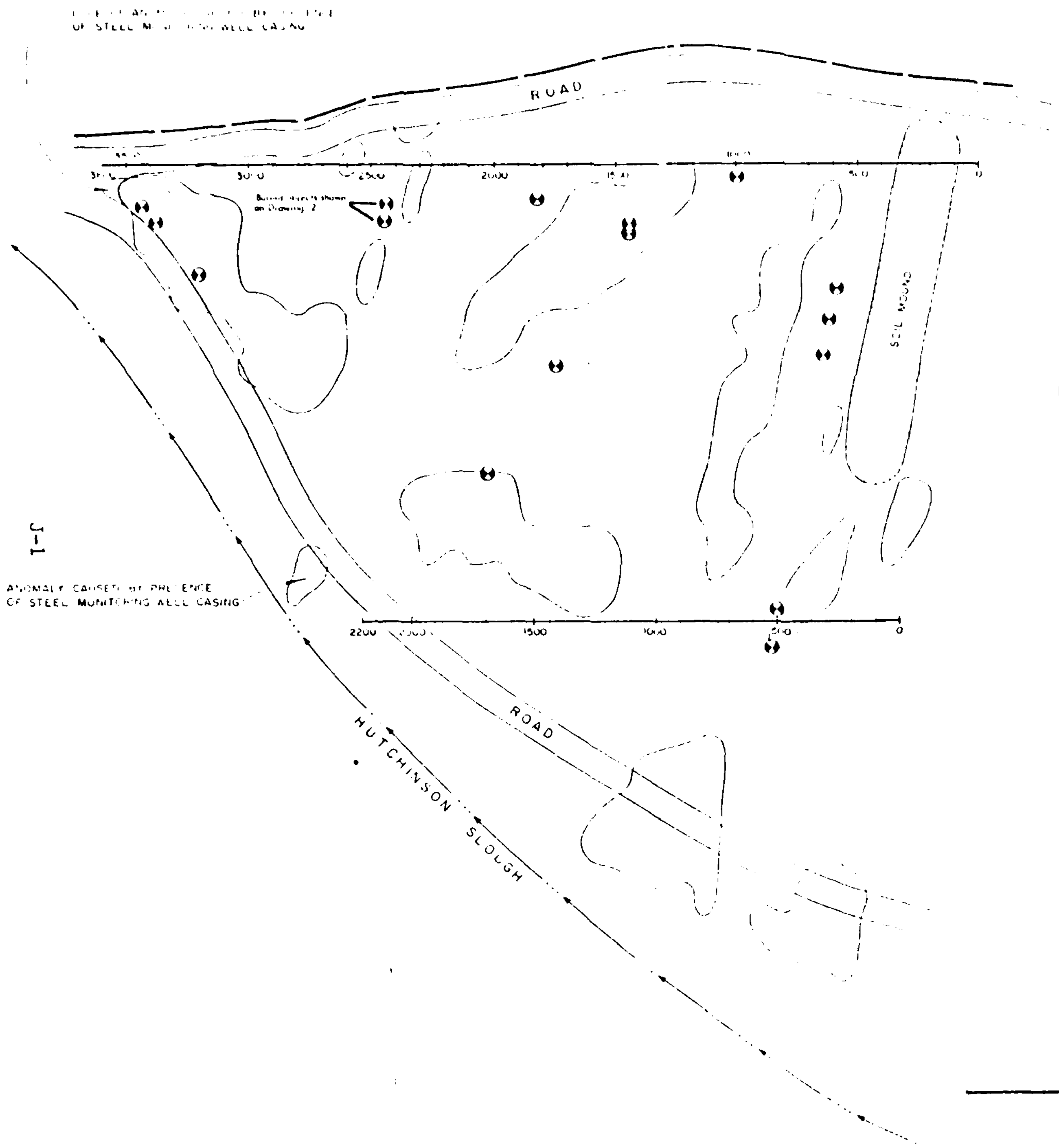
Professional Experience

Ms. Thurston serves as an engineer supporting AeroVironment projects in the areas of regulatory compliance, air toxics problems and waste site investigation projects for the U. S. Air Force. She is currently working on two site investigations, Beale AFB and Mather AFB, which are being investigated to evaluate possible contamination from fuel spills, storage tank leaks, landfills and poor waste handling. Ms. Thurston's responsibilities include collecting soil samples with hollow stem auger equipment, monitoring and logging cuttings from well-drilling operations, and designing and developing groundwater monitoring wells. Ms. Thurston has also worked on environmental compliance audits at Air Force manufacturing facilities. She was responsible for background research and report writing.

Prior to working for AV, Ms. Thurston served as a summer intern with the Rhode Island Department of Environmental Management (DEM). While with DEM, she conducted research and prepared an annual report on hazardous waste management in Rhode Island, which was submitted to the EPA. She also participated in RCRA groundwater testing and inspection of hazardous waste generators, transporters and storage sites within the state.

## APPENDIX J

Geophysical Tracings




## EXPLANATION:

AREAS OF STEEP GRADIENTS IN TOTAL MAGNETIC FIELD

BURIED OBJECT IDENTIFIED BY GROUND PENETRATING RADAR (GPR)

LOCATION OF FIELD CONTROL LINE

ABOVE-GROUND PIPELINE

## NOTES:

1. DIMENSIONS AND LOCATIONS DERIVED FROM TAPE AND PACING. MAPPED LOCATIONS ARE APPROXIMATE, AND MAY REQUIRE ADJUSTMENT TO RECONCILE DATA WITH A SURVEYED BASE MAP.
2. MAGNETIC ANOMALY ASSOCIATED WITH ABOVE GROUND PIPELINE OMITTED FOR CLARITY.

SCALE FEET

GPR AND MAGNETIC ANOMALY MAP

Converse Consultants

J-1

## APPENDIX K

Technical Operations Plan
(AV-R-85/598)

AV-R-85/598

# TECHNICAL OPERATIONS PLAN,

# PHASE II, STAGE I

# INSTALLATION RESTORATION PROGRAM

# BEALE AFB, CALIFORNIA

Prepared for

United States Air Force
Occupational and Environmental
Health Laboratory (OEHL)
Brooks Air Force Base, TX 78235-5000

October 1985

AV-R-85/598

# TECHNICAL OPERATIONS PLAN,

# PHASE II, STAGE I

# INSTALLATION RESTORATION PROGRAM

# BEALE AFB, CALIFORNIA

Prepared for

United States Air Force
Occupational and Environmental
Health Laboratory (OEHL)
Brooks Air Force Base, TX 78235-5000

By


AeroVironment Inc.
825 Myrtle Avenue
Monrovia, CA 91016


October 1985

## TABLE OF CONTENTS

## TABLE OF CONTENTS (Continued)

# 1. INTRODUCTION

## 1.1 Purpose and Scope of Study

The United States Air Force (Air Force) has developed the Installation Restoration Program (IRP) to identify and evaluate environmental contamination from past handling and disposal of hazardous materials at Air Force facilities. AeroVironment (AV) was retained to provide consulting services for the IRP under contract F33615-83-D-4000. Under that contract, AV has been tasked to conduct a Phase II, Stage I survey of Beale AFB in Yuba County, California.

The overall objective of the Phase II investigation is to define the magnitude, extent, direction, and rate of movement of identified contaminants in the groundwater. Staged field investigations are required to meet this objective. AV will recommend any additional investigations required beyond this stage including an estimate of costs.

The purpose of this task is to undertake a field investigation at Beale AFB, California: (1) to determine the presence or absence of environmental contamination within the specified areas of investigation; (2) if contamination exists, to determine the potential for migration of these contaminants in the various environmental media; and (3) to identify potential environmental consequences and health risks of migrating pollutants based on applicable local, state and/or federal standards. (The complete statement of work is included as Appendix A.)

Eighteen sites have been identified at Beale AFB in previous studies. The Phase II, Stage I survey will investigate all eighteen for the presence or absence of contamination. The eighteen sites are listed on Table 1-1 along with the scores given to them as part of the Phase I record search. AeroVironment will use background information generated during three previous efforts at Beale AFB listed below:

- Phase I record search of Beale, completed in April 1984 by Engineering Science Inc.

TABLE 1-1. Site summary.

| Rank | Site Name | Date of Operation or Occurrence | Overall Ranking Score |
|---|---|---|---|
| 1 | Discharge Area No. 1 - West Drainage Ditch | 1965-1984 | 84 |
| 2 | Photo Wastewater Treatment Plant and | 1967-1984 | 75 |
| | Photo Waste Injection Well No. 2 | 1967-1984 | 72 |
| 3 | Fire Protection Training Areas No. 1 & 2 | 1958-1984 | 64 |
| 4 | Discharge Area No. 2 - Battery Shop Dry Well | 1960's-1984 | 59 |
| 5 | Discharge Area No. 3 - SR-71 Shelter Area | 1966-1984 | 53 |
| 6 | Landfill No. 2 | 1950's-1980 | 52 |
| 7 | Discharge Area No. 4 - Army Biological Production Site | 1962-1969 | 52 |
| 8 | Discharge Area No. 6 - J-57 Test Cell | 1960's-1984 | 52 |
| 9 | Discharge Area No. 9 - Entomology Building 2560 | 1981-1984 | 51 |
| 10 | Discharge Area No 5 - J-58 Test Cell | 1960's-1984 | 50 |
| 11 | Discharge Area No. 7 - AGE Maintenance/ Drainage Area | 1960's-1984 | 48 |
| 12 | Discharge Area No. 10 - Entomology Building 440 | 1965-1980 | 48 |
| 13 | Landfill No. 1 | 1940's | 47 |
| 14 | Discharge Area No. 8 - Transformer Drainage Area | 1977-1979 | 44 |
| 15 | Landfill No. 3 | 1981-1984 | 39 |
| 16 | EEOD Disposal Area | Unknown | NA |
| 17 | Best Slough | Unknown | NA |
| 18 | Bulk Fuel Storage Area | Unknown | NA |

- Phase II presurvey report, completed in November 1984 by Roy F. Weston Inc.

- RCRA groundwater monitoring program at the photo wastewater plant, still in progress by Radian Corporation.

## 1.2 Installation Description and History

All of the eighteen sites which will be part of the Phase II investigation at Beale result from leaks, spills, runoff or disposal of materials which are considered hazardous and are normally used in the operation of this Air Force base. The following section is a physical description of the base and a history of general base activities.

### o Base Description

Beale Air Force Base is located in Yuba County between the Bear and Yuba Rivers, some 10 miles east of Marysville, California. It is approximately 45 miles north of Sacramento and 130 miles northeast of San Francisco. The base comprises approximately 22,944 acres of land located in the Sacramento Valley and the lower foothills of the Sierra Nevada Mountains. The western portion of the base is relatively flat, annual grassland while the eastern portion of the base has elevations ranging from 70 to 200 feet.

### o Base History

Camp Beale opened in october 1942. The 13th Armored Division was the first unit to be actively trained at Beale. However, during the course of World War II, the 81st and 96th Infantry Divisions also received training there. The camp was also used as a personnel replacement depot and prisoner of war encampment. It was the site of a 1,000-bed hospital and, at the end of the war, was used as the west coast separation center.

During the war, the camp supported a military population of more than 60,000 personnel. In May of 1947, Camp Beale was declared surplus by the War Department and the War Assets Administration assumed custody. In the early part of 1948, the United States Air Force asked the War Assets Administration for Beale and a transfer was arranged. For a period of about three years, until 1951, the base was used for bombardier-navigator training.

The base began to expand and, on November 27, 1951, the Department of the Air Force redesignated the Beale Bombing and Gunnery Range as "Beale Air Force Base." During Beale's early years in the Air Force, it underwent a number of jurisdictional changes being, at times, part of Air Training Command, Aviation Engineer Force and, finally, the Strategic Air Command. By April 13, 1957, ground was broken for the construction of the first runway. It went into operation on August 27, 1958.

In July 1959, Beale received its first KC-135 jet Stratotanker, which was assigned to the 903rd Air Refueling Squadron of the 456th Bombardment Wing. In September 1959 Beale became the support base for three Titan I missile sites. In 1960, B-52's were assigned to the base. By 1965, the Titan I missile program was inactivated. Coupled with the deactivation of the missile unit, however, was the activation of the 4200th Strategic Reconnaissance Wing that would man and maintain the SR-71.

In 1976, as a result of a major reorganization at Beale, all B-52 aircraft were reassigned. At the same time, the 9th Strategic Reconnaissance Wing (formally the 4200th Strategic Reconnaissance Wing) gained U-2 aircraft and the 99th Strategic Reconnaissance Squadron.

By October 1979, construction of a radar facility (known as PAVE PAWS) was essentially complete. The ten-story phased array radar is a detection and early warning system against sea-launched ballistic missile (SLBM) attack on the continental United States.

## 1.3 Description of Individual Sites

As a result of activities over the history of Beale AFB, eighteen sites are expected to show environmental contamination and so will be tested. These include discharge areas and landfills, as well as the photo wastewater plant and the fire protection training area. The history of each site is characterized briefly below:

- **Discharge Area No. 1 (West Drainage Ditch)**

Discharge Area No. 1 (West Drainage Ditch) is a drainage system which receives runoff from the flightline as well as the runway area. The drainage system discharges through a headwall located about 800 feet west of the main runway. Surface water quality data have documented oil and grease, trans-1,2 dichloroethene and trace amounts of TCE. Visual observations at the headwall indicate that oil has accumulated in the soils located in the ditch. Surface soils in the area typically comprise medium textured hardpan and claypan soils which have a characteristically low permeability.

- **Photo Wastewater Treatment Plant and Injection Well No. 2**

The Photo Wastewater Treatment Plant has been used since 1966 to treat photo wastes which contain silver and cyanide. In 1974, two unlined sludge ponds were constructed and used during the winter months. This practice was continued until 1978 when the ponds were used year round. The sludge from the plant is identified as a hazardous waste. From 1967 until 1984, whenever the treatment plant was shut down for maintenance, treated effluent (500 to 2,000 gallons) containing pentachlorophenol was discharged to the ground in the vicinity of the filters and Injection Well No. 2. Surface soils in the area typically comprise medium textured hardpan, which has a characteristically low permeability.

- **Fire Protection Training Areas Nos. 1 and 2**

Fire Protection Training Areas Nos. 1 and 2 have been used since 1958 for conducting fire training exercises. The sites have been combined because of their close proximity. From 1958 until the late 60's, combustible wast chemicals were accumulated in an unlined basin and burned weekly. Other chemicals were stored at the area in 55-gallon drums and later in two 23,000 gallon underground tanks. The soils in the area contain hardpan which has a very low permeability.

- **Discharge Area No. 2 (Battery Shop Dry Well)**

In Discharge Area No. 2 approximately 24 gallons per month of neutralized battery acid was discharged to a dry well adjacent to Building 1088. The discharge could have high lead concentrations. This dry well was in use from 1972 to 1983. The soils in the area contain hardpan which has a very low permeability.

- **Discharge Area No. 3 (SR-71 Shelter Area)**

The ground operation of the SR-71 aircraft results in about 300 gallons per week of JP-7 being lost in the vicinity of the SR-71 shelter area and on Taxiway No. 10. Some of the fuel runs off from the taxiway onto soil before reaching an oil-water separator. The soils in the area contain hardpan which has a very low permeability.

- **Landfill No. 2**

Landfill No. 2 was operated from the early 1950's until 1980. The site is approximately 56 acres and was used primarily for refuse disposal. Small amounts of chemicals were disposed in the landfill along with about 380 cubic yards of hazardous sludge from the photo wastewater treatment plant. These hazardous materials are contained in a large volume of nonhazardous waste, spread over a 56-acre area. The landfill is located in hardpan which has a low permeability.

- **Discharge Area No. 4 (Army Biological Production Site)**

Discharge Area No. 4 was a U.S. Army biological test site located in the southwestern portion of the base. The site was used to produce wheat stem rust from 1962 to 1969. During production, the chemicals used on-site were Freon, carbon dioxide, ethylene oxide and possibly TCE. In 1969, production stocks of wheat stem rust were chemically treated, incinerated and the ash plowed into the soil on the site. The Army has indicated that the site has been decontaminated.

- **Discharge Area No. 6 (J-57 Test Cell)**

Discharge Area No. 6 (J-57 Test Cell) is located adjacent to Building 1247. Chemicals discharged include JP-4, PD-680 and soap. The soils in the area contain hardpan.

- **Discharge Area No. 9 (Entomology - Building 2560**

Since 1981, wash water from cleaning pesticide application tanks was discharged to a gravel area adjacent to Building 2560 and allowed to percolate into the soil. Soils contain hardpan.

- **Discharge Area No. 5 (J-58 Test Cell)**

Discharge Area No. 5 (J-58 Test Cell) is located adjacent to Building 1154. The test cell is routinely used to test the SR-71 jet engine. Wastes which may have run off include JP-7, soap, oil, TCE and PD-680. The soils in the ditch adjacent to the test cell are oil-stained.

- **Discharge Area No. 7 (Age Maintenance/Drainage Ditch)**

Discharge Area No. 7 is a drainage ditch located behind Building No. 1225 (AGE maintenance). Vehicles parked on the paved area adjacent to the drainage ditch have leaked oil and hydraulic fluids on the ground over a long period of time.

Some of the contaminated soils have been removed in the past. The soils contain hardpan and are very impervious.

- **Discharge Area No. 10 (Entomology - Building 440)**

Discharge Area No. 10 is located adjacent to Building 440. From 1965 to 1980, the building was used by Entomology and two areas outside the building received spills of chemicals. The soils in the area around the building contain hardpan.

- **Landfill No. 1**

Landfill No. 1 is located in the southwestern sector of the base behind the sludge dewatering beds at the sewage treatment plant and adjacent to Hutchinson Creek. The site received refuse during the 1940's, but from what operation has not been determined.

- **Discharge Area No. 8 (Transformer Drainage Area)**

Discharge Area No. 8 (Transformer Drainage Area) is located near 34th and B Streets. The diked area was used from 1977 to 1979 to drain transformers before bringing them into the shop for repair. No visible contamination is present at the site. The soils contain hardpan. Eleven soil samples subsequently collected by base personnel indicated that PCB concentrations were below the detectable limit of 0.5 mg/kg. One sample was 14 mg/kg of PCB.

- **Landfill No. 3**

Landfill No. 3 is located east of Landfill No. 2 on 6th Street. The landfill was started in 1981 and is currently in use. The site comprises about 40 acres. The landfill has received general refuse and is believed to contain only small quantities of chemicals. The site has characteristic hardpan soils which are impermeable.

o **EEOD Disposal Area, Best Slough and Bulk Fuel Storage**

These three sites were added to the IRP list of sites since the Phase I records search. As a result, AV is not familiar with many of the details about any of these sites. However, it is known that the EEOD area is a trench used for disposal of used shells and other munitions containers. Possible contamination may have occurred from chemicals which have washed off of the containers. Best Slough was added because of the discovery of old empty drums in a trench near the creek. No information is available on what, if anything, was in the drums when they were dumped. The Bulk Fuel Storage Area was also added to evaluate potential contamination from the activities related to fuel management.

## 2. SITE INVESTIGATION SUMMARY

### 2.1 Overall Facility

To characterize the eighteen sites that have been identified at Beale AFB, AV will install a maximum of twenty groundwater monitoring wells, and drill a maximum of thirty-nine shallow exploratory hollow-stem auger borings. Samples collected for laboratory analysis will include up to 68 groundwater samples, 9 surface waters, and 176 soil, bottom sediment and waste drill cutting samples. Table 2-1 summarizes activities at each site. Detailed descriptions of these activities follow.

### 2.2 Investigation of Individual Sites

- **Site 1**

At Site 1 (Discharge Area No. 1 -- West Drainage Area) one groundwater monitoring well will be installed. Groundwater samples will be taken from it and from each of the nine Base Production Wells. Other samples at this site will include one of surface water and one of bottom sediment. In addition, one 2-foot hand auger core sample will be taken from four locations along the unnamed creek into which this site discharges.

- **Site 2**

Site 2 (Injection Well No. 2) will have one groundwater monitoring well installed. Samples will be collected from it and the four existing wells. Four exploratory soil borings will be drilled, establishing one as a background. From each of these, two soil samples will be analyzed.

- **Site 3**

Five groundwater wells will be installed to encircle Site 3 (Fire Protection Training Areas No. 1 and 2, FPTA 1&2). Groundwater samples will be taken from

TABLE 2-1. Beale AFB site summary.

| Site | Groundwater Monitoring Well | Groundwater Samples(1) | Soil Borings | Soil Samples | Surface Water Samples | Bottom Sediment Samples | Hand Auger Samples | Grab Samples | Magnetometer Survey and GPR |
|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 downgradient | 1 from new monitor well, plus 1 from each of 9 base production wells | | | 4 from creek | 4 from creek | 4 - 2' from creek | | |
| 2 | 1 downgradient between I.W. 1 & 2 | 1 from new well, plus 1 from each of 3 RCRA wells | 4 | 8 from borings | | | | | |
| 3 | 5 encircling site | 1 from each well | 8 - 3 in each F.T. area; 1 downgradient of underground storage tanks; 1 upgradient of F.T. area | 24 - 3 of 4 from each boring | | 2 from overflow pond | 5 - 2' - 2 from overflow collection pit; 3 from downstream drainage ditch | | |
| 4 | 1 downgradient from site | 1 from new well | 1 upgradient from dry well | 4 - at 10', 20' 25', 30' during well installation; 4 - at 10' 20', 25', 30' from soil boring | | | | | |
| 5 | 1 downgradient from site | 1 from new well | 6 - 1 to establish background conditions; 5 others | 18 - 3 from each boring | | | | | |
| 6 | 4 - 1 to establish background; 3 others | 1 from each well | | | | | | | |
| 7 | | | | | | | 16 - 1' at incineration disposal site | | |
| 8 | 1 downgradient from site | 1 from new well | | | | | 3 - 2' from drainage between site & Reeas Creek | | |
| 9 | | | 3 - 1 background; 2 others | 6 from borings | | | | | |

# TABLE 2-1. (Continued)

| Site | Groundwater Monitoring Well | Groundwater Samples[1] | Soil Borings | Soil Samples | Surface Water Samples | Bottom Sediment Samples | Hand Auger Samples | Grab Samples | Magnetometer Survey and GPR |
|---|---|---|---|---|---|---|---|---|---|
| 10 | 1 downgradient from site | 1 from each well | | | | | 4 - 2'; 1 background; 3 downstream drainage ditch | | |
| 11 | 1 downgradient from site | 1 from each well | 4 - 1 background; 3 in gravel pad area | 8 - 2 from each boring | | | 4 - 2' from drainage center | | |
| 12 | | | 3 - 1 background; 2 in gravel pad and overflow area | 6 - 2 from each boring | | | | | |
| 13 | 2 downgradient from site | 1 from each well | | | 4 - 3 downstream of Hutchinston Creek; 1 upstream of landfill | 4 - 3 downstream of Hutchinson Creek; 1 upstream of landfill | | | 1 as a wide grid survey |
| 14 | | | | | | | 12 - 2' from within bermed site | | |
| 15 | 2 downgradient from site | 1 from each well | | | | | | | |
| 16 | • | | | | | | | 6 - 3 from ordinance burn pit; 3 from metal disposal trench | |
| 17 | | | 6 - 1 background; 5 downgradient | 12 - 2 from each boring | 1 from nearby stream | | 6 - 1'; 2 from each of 3 trenches | | |
| 18 | | | 4 - 20' deep; 1 background; 3 downgradient | 16 - 1 from each 2.5' interval of each boring | | | | | |
| Total | 20 | 32 | 39 | 106 | 9 | 10 | 22 - 1'; 32 2' | 6 | 1 |

(1) One sample will be collected during each of two sampling periods.

each. To determine the vertical extent of soil contamination, three soil borings will be placed within the site and five others will be drilled around the site, with one used to establish background contamination. Three soil samples from each boring will be analyzed. From the overflow pond, two bottom sediment samples will be extracted. A 2-foot hand auger will be used to take (1) two core samples from within the overflow collection pit and (2) three core samples from downstream locations within the drainage pit. These core samples will be divided into zero-one and one-two foot intervals for a total of ten core samples to be analyzed.

- **Site 4**

At Site 4 (Discharge Area No. 2 -- Battery Shop Dry Well) one monitoring well will be installed downgradient of the site from which groundwater samples will be taken. During well installation, soil will be sampled at 10-, 15-, 20-, 25- and 30-foot intervals.

- **Site 5**

Downgradient from Site 5 (Discharge Area No. 3 -- SR-71 Shelter) one groundwater monitoring well will be installed and groundwater samples taken. Six exploratory soil borings will be drilled -- one background and five in the pad runoff area. Three samples will be selected from each boring for a total of eighteen samples to be analyzed.

- **Site 6**

At Site 6 (Landfill No. 2) one groundwater monitoring well will be installed upgradient of the site (background), one monitoring well between Landfill No. 2 and Landfill No. 3 and two monitoring wells downgradient of the site. Groundwater samples will be collected from each well.

- **Site 7**

At Site 7 (Discharge Area No. 4 -- Biological Production Site), within the fields used for disposal of incinerated wheat rust material, 1-foot hand auger core samples will be taken at sixteen locations, creating four composite samples to be analyzed.

- **Site 8**

Downgradient from Site 8 (Discharge Area No. 6 -- J-57 Test Cell) one groundwater monitoring well will be installed and groundwater samples taken. At three downstream locations receiving drainge from the site, one 2-foot hand auger core will be collected. These cores will be subdivided into 1-foot segments for a total of six core segments to be analyzed.

- **Site 9**

At Site 9 (Discharge Area No. 9 -- Entomology Building 2560) three exploratory soil borings will be drilled, two within the gravel pad and overflow area and one upgradient from this area to establish background. Six soil samples will be selected from these borings for analysis.

- **Site 10**

At Site 10 (Discharge Area No. 5 -- J-58 Test Cell) one groundwater monitoring well will be installed downgradient from the site. Groundwater samples will be collected from this well. Four 2-foot hand auger samples will be taken, three at downstream locations within the ditch receiving drainage from the site and one upstream to determine representative background conditions.

- **Site 11**

At Site 11 (Discharge Area No. 7 -- AGE Maintenance) one groundwater monitoring well will be installed downgradient and water samples will be collected.

Three exploratory soil borings will be drilled in the gravel pad area which received washdown water from the AGE maintenance shops. The background boring will be installed upgradient from the site. Two soil samples from each boring will be selected for analysis. One 2-foot hand auger core sample will be taken at four locations within the AGE maintenance shop drainage ditch. These cores will be subdivided into 1-foot segments, so that eight samples will be analyzed.

- **Site 12**

At Site 12 (Discharge Area No. 10 -- Entomology Building 440) two exploratory soil borings will be drilled within the gravel pad and overflow area. Upgradient from these two borings a background boring will be drilled. Two soil samples from each boring will be analyzed.

- **Site 13**

Site 13 (Landfill No. 1) will require a magnetometer and ground penetrating radar survey to define the site and to locate buried drums for future investigation. Downgradient from the site, two groundwater wells will be installed from which groundwater samples will be collected and subsequently analyzed. One surface water and one bottom sediment sample will be taken at four locations on Hutchinson Creek, i.e., one upstream of the landfill, one adjacent to the landfill, and two downstream of it. Surface water sampling will take place once during dry season conditions and once during wet season conditions.

- **Site 14**

At Site 14 (Transformer Drainage Area) twelve 2-foot long auger cores will be collected from within the bermed site. These will be divided into 1-foot intervals for analysis.

- **Site 15**

Site 15 (Landfill No. 3) will require the installation of two groundwater monitoring wells in a downgradient location. Groundwater samples will be collected from each well.

- **Site 16**

At Site 16 (EEOD Disposal Area) three surface soil grab samples will be collected from the scrap metal disposal trench and three from the current ordinance burn pit. One composite sample will be made from each set of three.

- **Site 17**

At Site 17 (Best Slough) six exploratory soil borings will be drilled. To determine if leaching is occurring, five borings will be located downgradient but in close proximity to existing trenches. A background boring will be placed upgradient from the trenches as well. Two soil samples will be taken from each boring. From within the trenches, six more soil samples will be taken with a 1-foot hand auger. One surface water sample will be collected from a nearby stream.

- **Site 18**

At Site 18 (Bulk Fuel Storage Facility) four exploratory soil borings will be drilled to a depth of 20 feet, three borings downgradient from the site and one upgradient to determine a background. Core samples will be collected at each 2.5-foot interval. Four samples from each bore hole will be selected for analysis.

# 3. FIELD SET UP

The field team will coordinate field activities with Beale AFB personnel. Upon arrival at Beale, AV and drilling company personnel will meet with base security, fire protection, fuels management and civil engineering personnel to review procedures to be followed by the field team.

All base activities will be coordinated with MSgt. William Priest of the Base Environmental Engineering Office. AV field personnel will check-in at the main gate each morning and check-out at the end of the work day. Work may be conducted at more than one location at a time and AV personnel will be at the locations to oversee subcontractor operations. Work will be conducted at hours approved by base personnel.

Because of the small scope of work at any given site, a base command post will not be set up. At each drilling location a decontamination line and hotline will be established. AV's site safety officer and site manager will monitor the specific site conditions and make whatever changes are necessary to field operating procedures to ensure physical safety and technical accuracy.

## 4. CALIBRATION OF FIELD EQUIPMENT

All field equipment is periodically checked as part of our ongoing quality control policy. Immediately before sending an instrument to the field, it is calibrated according to the manufacturer's specifications. The field crew periodically rechecks the calibrations. Specific procedures for the instruments we will take to Beale AFB are as follows:

Orion Research Model 211 Digital pH Meter -- Two point calibration against known standards, recheck daily. The two buffer solutions will be selected to bracket the expected pH range of sample waters.

Horizon Ecology Company Type 1840-10 Conductivity Meter -- Two point calibration against known standards, recheck daily.

Gastech Protector Model 1562, Portable Gas Alarm ($O_2$/explosimeter) -- Check against calibration gas containing 2.5% methane and 17% $O_2$ (factory specification calibration gas).

A.I.D. Model 580 Portable Organic Vapor Meter -- Check span against calibration gas of a known concentration of butadiene (factory specification calibration gas). Check zero each day with clean background air.

Powers Electric Company Well Sounder -- Measure calibrated probe cable with steel tape to check that the depth markings are accurate each day. Correction factors, if needed, will be noted in the logbook.

Foxboro Century Model OVA-128GC Portable Organic Vapor Analyzer -- Calibration will be checked at least twice a day against a methane-in-air standard and will be recalibrated if reading exceeds $\pm 5\%$ error. Instrument will be zeroed each day with clean background air.

# 5. EQUIPMENT MAINTENANCE

AV will use only a limited amount of equipment to perform the field work at Beale AFB. All the equipment we expect to use has been used by AV personnel in previous field situations. All equipment performs reliably in field situations (including cold weather) and requires little or no field maintenance. It will be checked for proper operation prior to leaving the office and daily during the period of use according to standard procedures recommended by the manufacturer. During transportation and on-site storage, instruments will be stored in a clean, dry, temperature-controlled location. During field use, instruments which are sensitive to the expected cold temperatures will be kept out of extreme conditions whenever possible. Additional batteries and AC chargers will be carried with electrical instruments.

## 6. FIELD ANALYTICAL PROCEDURES AND DATA REPORTING

### 6.1 Chemical Data

Specific conductance, pH and temperature will be recorded for all ground-water samples. We will use an Orion Research digital pH meter, a Horizon Ecology Company type 1841-10 conductivity meter, as well as a thermometer for these measurements.

Specific conductance (SC), pH, and temperature will be measured continuously during purging of the wells. Once all parameters have stabilized, and at least three well volumes have been pumped, we will assume that the well has been adequately purged and we will take our water sample using a Teflon bailer. Readings for pH, SC, and temperature taken from the first bailer of sample will be entered in the logbook. All instrument probes will be rinsed in distilled water between wells.

### 6.2 Hydraulic Data

After all the wells have been developed and allowed to recover from development pumping for a minimum of 24 hours, static water levels will be determined. All water levels will be recorded as depth-to-water from a known measuring point (MP) and will be adjusted to actual depth to water from ground level (GL) using survey data. Water levels will be measured with a Powers Electric Company well sounder and will be recorded in the logbook to the nearest 0.05 feet. The Powers sounder uses a water level sensing probe attached to a calibrated cable. When the sounder reaches water, a current passes between two wires in the probe, deflecting a meter at the surface. The cable attached to the probe is numbered with brass markers at 5-foot intervals so depth to water may be accurately noted, and a tape measurement is all that is required.

After all the wells have recovered from pumping and water sample collection, they will be measured a second time to confirm our previous measurements.

The sounder probe will be rinsed in distilled water between wells to minimize chances for cross-contamination.

A water level contour map will be generated from the water levels measured during the field work at Beale AFB; water level measurements, as well as field pH, specific conductance and temperature measurements, will be conducted during both rounds of sampling. The first round will take place during the wet season (November or December), and the second round approximately six months later, during the dry season.

### 6.3 Soil Boring Data

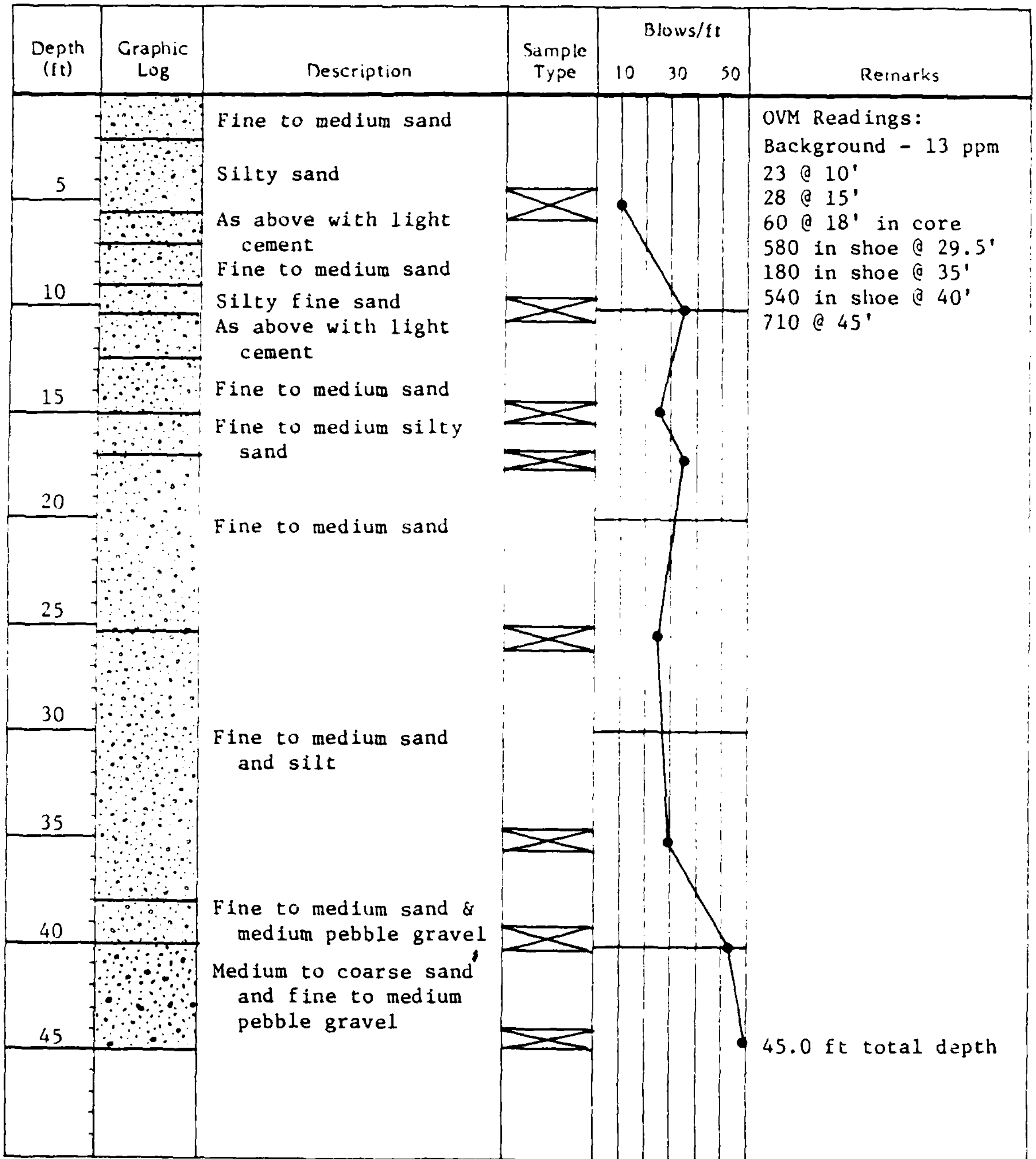
Soil samples for lithologic description will be collected at 5-foot intervals and lithologic logs will be compiled for all soil borings and well bore holes drilled at Beale AFB. In addition to the soil samples, the site geologist will monitor the cuttings the auger brings to the surface for signs of changing formations. Organic vapor readings will be taken from the cuttings and the drive samples during drilling and elevated readings will be noted in the log. Elevated vapor readings will also be used to readjust site safety requirements. An example of a "typical" boring log is shown as Figure 6-1.

### 6.4 Surveying Data

The surface elevation of all groundwater monitoring wells will be determined to an accuracy of $\pm 0.05$ feet with respect to known elevations on base. This work will be performed by personnel experienced in field surveying to this degree of accuracy, using a standard engineers transit. From these measurements, the measuring point for each well will be determined. All new wells will also be horizontally located to an accuracy of 1.0 feet. Positions of the wells will be recorded on both project and site-specific maps.

### 6.5 Geophysical Procedures and Data

Geophysical methods will be used to define the lateral and vertical extent of the Landfill No. 1 and to aassess the nature of debris at the site. AeroVironment



GEOTECHNICAL BORING LOG

BORING NO. LI-03

| | | | |
|---|---|---|---|
| Project Name | Williams I.R.P. | Logged By | TO'G |
| Project No. 10416E | No. of Samples 13 | Checked By | |
| Site LFSA | Drilling Method Auger | Date | 10-2-84 |

| Depth (ft) | Graphic Log | Description | Sample Type | Blows/ft 10 30 50 | Remarks |
|---|---|---|---|---|---|
| | | Fine to medium sand | | | OVM Readings: |
| | | | | | Background - 13 ppm |
| 5 | | Silty sand | | | 23 @ 10' |
| | | | | | 28 @ 15' |
| | | As above with light cement | | | 60 @ 18' in core |
| | | Fine to medium sand | | | 580 in shoe @ 29.5' |
| 10 | | Silty fine sand | | | 180 in shoe @ 35' |
| | | As above with light cement | | | 540 in shoe @ 40' |
| | | | | | 710 @ 45' |
| 15 | | Fine to medium sand | | | |
| | | Fine to medium silty sand | | | |
| 20 | | Fine to medium sand | | | |
| 25 | | | | | |
| 30 | | Fine to medium sand and silt | | | |
| 35 | | | | | |
| 40 | | Fine to medium sand & medium pebble gravel | | | |
| | | Medium to coarse sand and fine to medium pebble gravel | | | |
| 45 | | | | | 45.0 ft total depth |

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FIGURE 6-1. Typical boring log.

has subcontracted Converse Consultants of San Francisco to provide these services. A site survey will be performed using GSSI SIR 7 or 8 Ground Penetrating Radar to help detect site boundaries, contaminants and groundwater. The equipment will be towed across the site in a grid pattern, with actual spacing determined in the field. The survey will be conducted initially with a low frequency antenna for pentration and, as required, could later be switched to a high frequency antenna for better resolution.

A walking grid electro-magnetic survey will be provided using a Geometrics portable magnetometer or a Geonics EM-31 Induced Conductance Metal Detector. This additional work will be done to assess the quantity and orientation ferrous metal debris on the site, especially in the trenches. Actual grid spacing will be determined in the field. Appropriate corrections will be applied for diurnal magnetic variations and weather conditions. All data will be translated into map form showing locations of inferred objects, fill depths (if determined), groundwater depths (if determined), and boundaries of disposal area.

# 7. SAMPLE DOCUMENTATION

## 7.1 Sample Numbering

All samples collected from Beale AFB for laboratory analysis will be given a six digit code for rapid identification. The first two digits, as shown in the following list, will indicate the site from which the sample was taken.

| | | |
|---|---|---|
| 01 | - | Discharge Area No. 1 (DA-1) -- West Drainage Area |
| 02 | - | Injection Well No. 2 (INJ-2) |
| 03 | - | Fire Protection Training Areas No. 1 and 2 (FPTA1&2) |
| 04 | - | Discharge Area No. 2 (DA-2) -- Battery Shop Dry Well |
| 05 | - | Discharge Area No. 3 (DA-3) -- SR-71 Shelter |
| 06 | - | Landfill No. 2 (LF-2) |
| 07 | - | Discharge Area No. 4 (DA-4) -- Biological Production Site |
| 08 | - | Discharge Area No. 6 (DA-6) -- J-57 Test Cell |
| 09 | - | Discharge Area No. 9 (DA-9) -- Entomology Building 2560 |
| 10 | - | Discharge Area No. 5 (DA-5) -- J-58 Test Cell |
| 11 | - | Discharge Area No. 7 (DA-7) --- AGE Maintenance |
| 12 | - | Discharge Area No. 10 (DA-10) -- Entomology Building 440 |
| 13 | - | Landfill No. 1 (LF-1) |
| 14 | - | Transformer Drainge Area (DA-8) |
| 15 | - | Landfill No. 3 (LF-3) |
| 16 | - | EEOD Disposal Area (EEOD) |
| 17 | - | Best Slough (BS) |
| 18 | - | Bulk Fuel Storage Facility (BFSF) |

The second two digits of the code will identify the sampling location within the site. These numbers will be assigned in chronological order. The first location sampled at a site will be assigned XX-01-XX. Because upgradient or background locations will not necessarily be known before field samples are taken, no specific identifier will be given for them.

The last two digits will indicate the sample collected at a given sample location in a given site. The first of these last two digits will be a letter identifying the type of sample collected:

| | | |
|---|---|---|
| G | - | Groundwater |
| W | - | Surface water |
| B | - | Bottom sediment |
| H | - | Hand auger |
| S | - | Soil boring |
| R | - | Surface grab |
| C | - | Contaminated cuttings (from drums) |

The second of these last two digits, XX-XX-X1, identifies the sample by the chronological order in which it was taken, based upon each sample type. For soil samples, the numbering order will increase with depth, reflecting that surface soil samples are collected first. However, this number will not reflect the specific depth of the sample.

The following examples will help clarify the sample numbering system:

02-01-S3: The third soil sample (15 feet) collected from boring No. 1 at the Injection Well No. 2 site (Site 2)

06-04-G1: The first groundwater sample collected from well No. 4 at Landfill No. 2 (Site 6)

All quality assurance (QA) samples (splits) being sent to the Air Force OEHL will be numbered according to the Air Force sample numbering system outlined in AF Form 2752. AeroVironment QA samples will be numbered using the six digit code described above, and will be "blind" QA samples. This will minimize the possibility of prejudicial treatment given to QA samples either in the field or in the laboratory.

## 7.2 Sample Labeling

Each sample container from Beale AFB will be labeled with a sticker similar to the one shown in Figure 7-1. The sticker is part of a three-piece labeling system which will help track samples and minimize the risk of misidentification.

The labeling system has a main sticker which is attached to the sample container. On the main sticker, the field samplers will record the project name, time, depth (for hand auger and soil boring samples) and sample code. The main sticker and the two associated stickers will be machine stamped in advance of the field work with a common sequential number. After placing the main sticker on the container, the other two stickers will be placed in the field logbook and on the chain-of-custody form. Samples which require multiple containers will be labeled with one sticker per container. Each container of the set will have a different sequential sticker number, but the same sample code will be used. Air Force samples (splits) with multiple containers will all be labeled with the same Air Force number.

## 7.3 Sample Chain of Custody

The samples will be collected, preserved, sealed and packaged by the AeroVironment field team. All pertinent information on the collection, handling and paperwork for the Beale samples will be entered in the project logbook at the time of the activity. The sample stickers will be placed on the sample container and in the logbook at the time of collection. The field team will also enter the sampling conditions in the logbook at this time.

At the end of the day, a chain of custody (C of C) form will be completed for samples collected for AV's laboratory (Acurex) during that day (see Figure 7-2). The last piece of the sample sticker set will be affixed onto the C of C and the field team leader will sign the form, indicating that all listed sample containers are accounted for. The C of C will be packed with the samples in the shipping container.

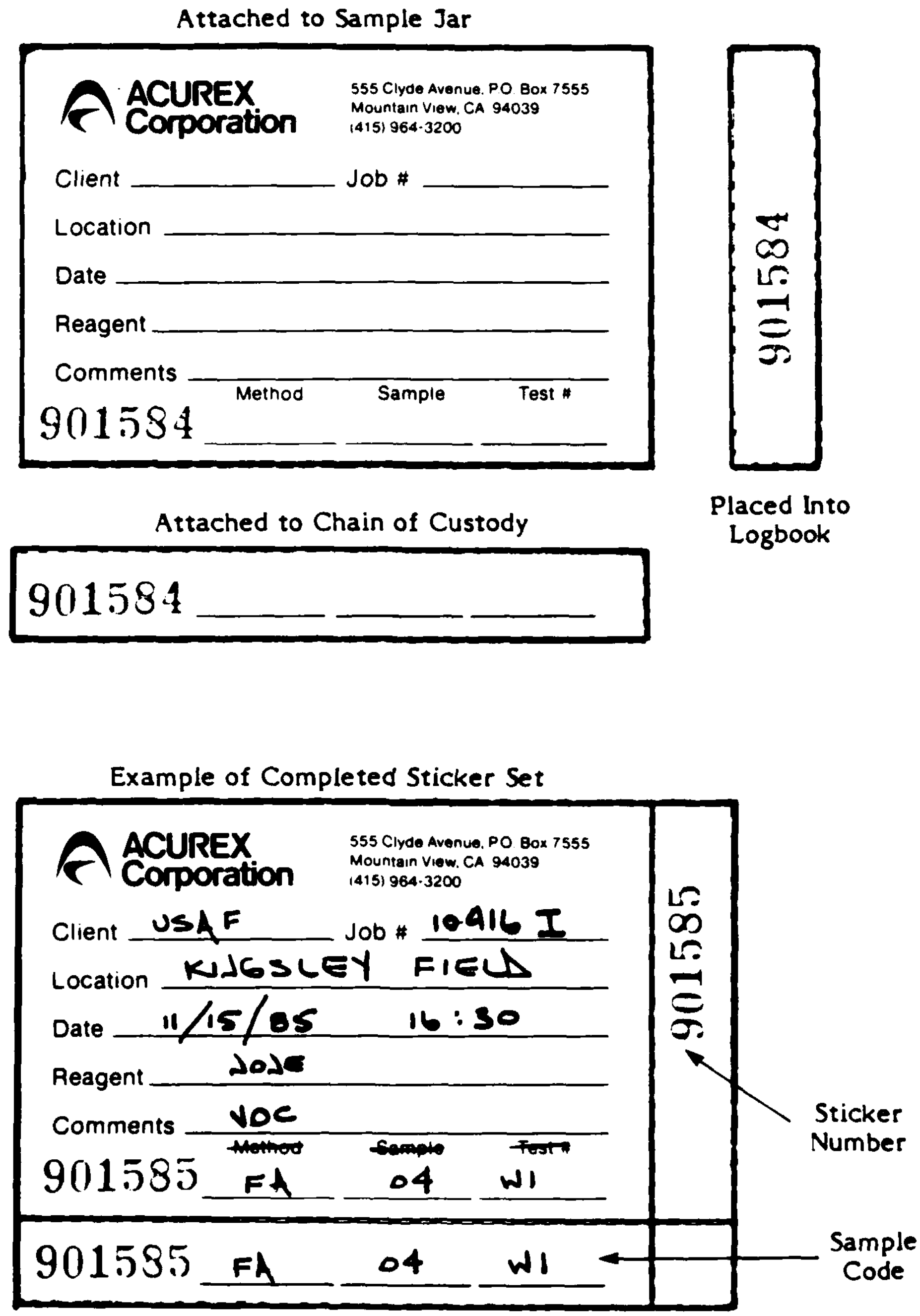



FIGURE 7-1. Sample labeling system sticker sets.

ACUREX Corporation / AeroVironment Inc.

Sheet 1 of 1 in this shipment

# SAMPLE HANDLING LOG

## Chain of Custody

Site: WILLIAMS AFB

AV Project No.: 10916E

Date: 9/28/84

Acurex Project No.:

Test Location: LFSA

Sampler(s): DOUG TAYLOR / TIM [illegible]

**SAMPLES:**

| | | | |
|---|---|---|---|
| 1. | 810674 L1 01 01 | 7. | 810681 L1 02 01 |
| 2. | 810675 L1 01 02 | 8. | 810683 L1 02 02 |
| 3. | 810673 L1 01 03 | 9. | 810682 L1 02 03 |
| 4. | 810676 L1 01 04 | 10. | 810685 L1 02 04 |
| 5. | 810679 L1 01 05 | 11. | 810686 L1 02 05 |
| 6. | 810680 L1 01 06 | 12. | 810669 L1 09 01 |

Field Supervisor: [illegible] Date: [illegible]
Samples Collected: [illegible]

Field Supervisor: DOUG TAYLOR Date: 9/28/84
Samples Released to: FEDERAL EXPRESS Time: 5 05

Laboratory: Date:
Samples Accepted: Time:

Laboratory: Acurex Date: 9/29/84
Samples Accepted: Eugene A. Jablan

After Analysis Samples To Be: Disposed of ______ Saved for Storage ______

Project Engineer: ______

FIGURE 7-2. Typical chain of custody form.

When the shipping container is received at the Acurex laboratory, the samples will be checked against the C of C form to verify that all containers have been received in good condition. The Acurex sample custodian will sign the C of C and return it to AV's offices.

The Acurex laboratory will log the samples into its system and assign them internal laboratory numbers to track the analyses. These internal numbers will not be a part of the field activities documentation.

Air Force samples will be collected and an AF Form 2752 will be completed for each sample (multiple container samples will be under one form). The forms will be shipped with the samples to the OEHL laboratory.

### 7.4 Sample Shipping

The samples collected at Beale AFB will be packed with ice. Water samples with limited holding times will be shipped on an overnight carrier to Acurex and OEHL laboratories at the end of the day they are collected. Samples with longer holding times will be stored on-site, with appropriate temperature control, until a full shipment is collected. The samples will be sealed with strapping tape and turned over to the shipping company (Federal Express or equivalent). The shipper will deliver the samples directly to each laboratory the next day.

Field personnel will retain all airbill records and will telephone the laboratory the day of scheduled delivery to confirm receipt of samples.

## 8. DRILLING AND INSTALLATION OF GROUNDWATER MONITOR WELLS

### 8.1 Drilling

Drilling will be done using the air rotary method with casing hammer. This method uses a standard air rotary drilling rig to advance the hole. Since the air rotary method does not use a mud or bentonite based drilling fluid, no "wall cake" holds the hole open. To keep it from collapsing in around the drill pipe, a drive casing (approximately 10 inches I.D.) is driven down around the drill string using a casing hammer.

This is the preferred method for drilling in unconsolidated material such as is found at Beale AFB. By using air as the drilling fluid (750 cfm), no contaminants are added to the hole during the drilling program.

### 8.2 Soil Sampling

Soil samples will be recovered at 5-foot intervals by placing a 5-gallon bucket under the discharge pipe of the drilling rig. Once a sufficient volume of sample has been collected to allow for adequate lithologic description, the bucket will be emptied into an appropriate storage container and stored as required by the Air Force. These soil samples will be used for lithologic description only and are not to be used for any chemical analysis.

### 8.3 Monitor Well Construction and Completion

Monitoring wells will be constructed while the drive casing is still in place. The 4-inch stainless steel well screen and mild steel riser pipe will be assembled and lowered to the appropriate depth. Once the well pipe is in place, gravel pack and bentonite will be installed, as specified by the Air Force, by pouring them down the annular space between the drive casing and the well casing. The drive casing will act as a large tremie pipe. As the gravel and bentonite are added, the drive casing will be withdrawn. Grout, as required, will be installed in a like manner.

As the well is being constructed, the actual levels of gravel, bentonite, and grout will be varified by lowering a weighted tape down the annulus until the material in question can be felt.

Surface completion may be flush with the ground or above ground as required by base personnel. The surface completion has been specified in detail in the Air Force statement of work and it will be followed as written. As-built drawings of all wells installed on site will be included in the report.

## 8.4 Well Development

All monitoring wells will be developed by swabbing with a close-fitting swab (or surge block) and pumping or bailing until the water is clear and free of sand. Swabbing loosens the fine silts and clays around the well casing and draws them into the well. This makes the formation around the well screen more permeable and more likely to produce a significant amount of water for sampling.

The sediment drawn into the well by swabbing is either held in suspension and bailed or pumped out of the well, or settles out into the screened section to be bailed later. Developing air rotary drilled wells is relatively easy because no drilling mud is used during construction.

Yields for these wells are expected to be from 3 to 30 gpm.

## 9. SOIL AND SEDIMENT SAMPLING

### 9.1 Exploratory Borings

Shallow exploratory borings will utilize a hollow-stem continuous flight auger and will not exceed 15 linear feet in depth unless otherwise specified.

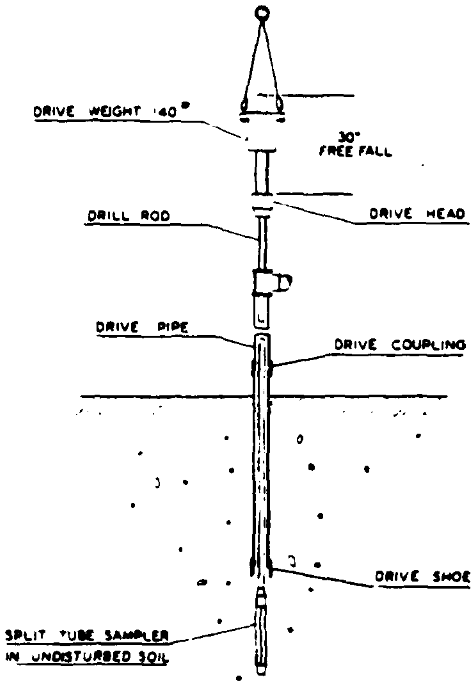
Soil samples will be collected utilizing a "California Sampler" or "Ring Sampler" (Figure 9-1). The sampler will be 18 to 24 inches in length with a 3.2 in O.D. and a 2.5 in I.D. The shell will be split along its length to allow opening. The entire length of the sampler will be lined with thin-walled stainless steel rings. These, when capped, form the sample containers. Each ring is 6 inches in length, 2.5 in O.D. and 2.375 in I.D. If difficulty is experienced in obtaining complete samples in the rings, stainless steel finger retainers will be used. Samples will be collected at depths specified by AeroVironment.

The samples will be collected by driving the sampler ahead of the auger at the desired depth with a standard 140 pound hammer falling 30 inches. The number of blows required to advance a given sampler each six inch interval will be recorded. Refusal will be defined as one hundred blows per 6 inches. The blow counts will be recorded on the boring logs.

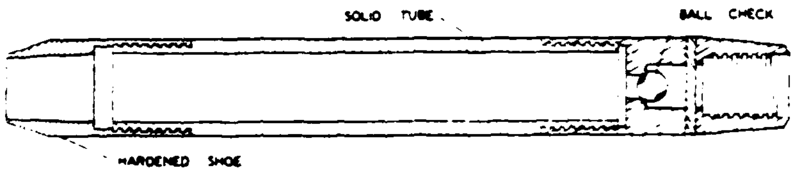
Soil samples will be collected at 5-foot intervals, and two of the samples collected at each bore hole will be analyzed. The rest of the samples will be refrigerated by Acurex for long-term storage in the laboratory. All soil samples will be maintained for the duration of the contract.

After sampling has been completed, bore holes will be grouted to the surface to prevent downhole contamination.

Using this system, drillers will be able to collect an essentially undisturbed core, from which the most representative sample(s) can be collected for laboratory analysis. As each split spoon barrel is opened, the stainless steel cylinders will be marked with their appropriate depths, and the ends of the samples will be visually




Driving sample




Solid tube sampler

FIGURE 9-1. Ring sampler and sample driving assembly. Source: M.R. Scalf, J.F. McNabb, W.J. Dunlap, R.L. Cosby, R.S. Kerr, and J.S. Fryberger: Manual of ground-water quality sampling procedures.

examined. After the quick initial inspection of the soil type, the cylinder ends will be covered with aluminum foil, capped with airtight plastic caps, and sealed around the cap edges with electrical tape. The field geologist will document the soil type in the logbook. This method provides an undisturbed, airtight sample to be shipped in the lab in its collection cylinder. After the sample is sealed, it will be labeled with its sample code and stored on ice.

AV considers the "ring sampling" method proposed for Beale AFB better than traditional split-spoon sampling method used on most EPA drilling programs. Traditional split spoons require reusing the sampler, opening and mixing the soil sample, and transferring the sample into the sample jar. Although we will still use a split barrel, the inner rings virtually eliminate the sampling errors of cross-contamination, sample mishandling, and loss of volatile compounds.

Most samples will be taken in pairs, with the top cylinder of the pair going to AeroVironment's lab (Acurex) and the lower cylinder to the OEHL laboratory at Brooks AFB, Texas. Thus, the Air Force sample will not be a "split" in the strict sense, but an undisturbed sample from the following 6 inches of formation. Quality assurance (QA) samples, taken for Acurex laboratory checks, will also be taken from immediately adjacent cylinders. Like the OEHL sample, QA samples will not be true splits. True splits cannot be collected using the ring sampling method because soils are not going to be mixed. Although some differences may exist between soils from different depths, these differences are expected to be insignificant from soils only 6 inches apart.

### 9.2 Hand Auger Samples

Several shallow hand-collected samples will be taken at specified Beale AFB sites. The soil sampler that will be used (Figure 9-2) holds a single ring 6 inches in length, identical to those used for the soil borings described in the previous section. The samples will be collected by driving the sampler 6 inches into the soil with a slide hammer. After the sample is taken, the ring containing the sample will be removed, visually inspected, then covered with aluminum foil and capped with airtight plastic caps. The cap edges will be sealed with electrical tape.

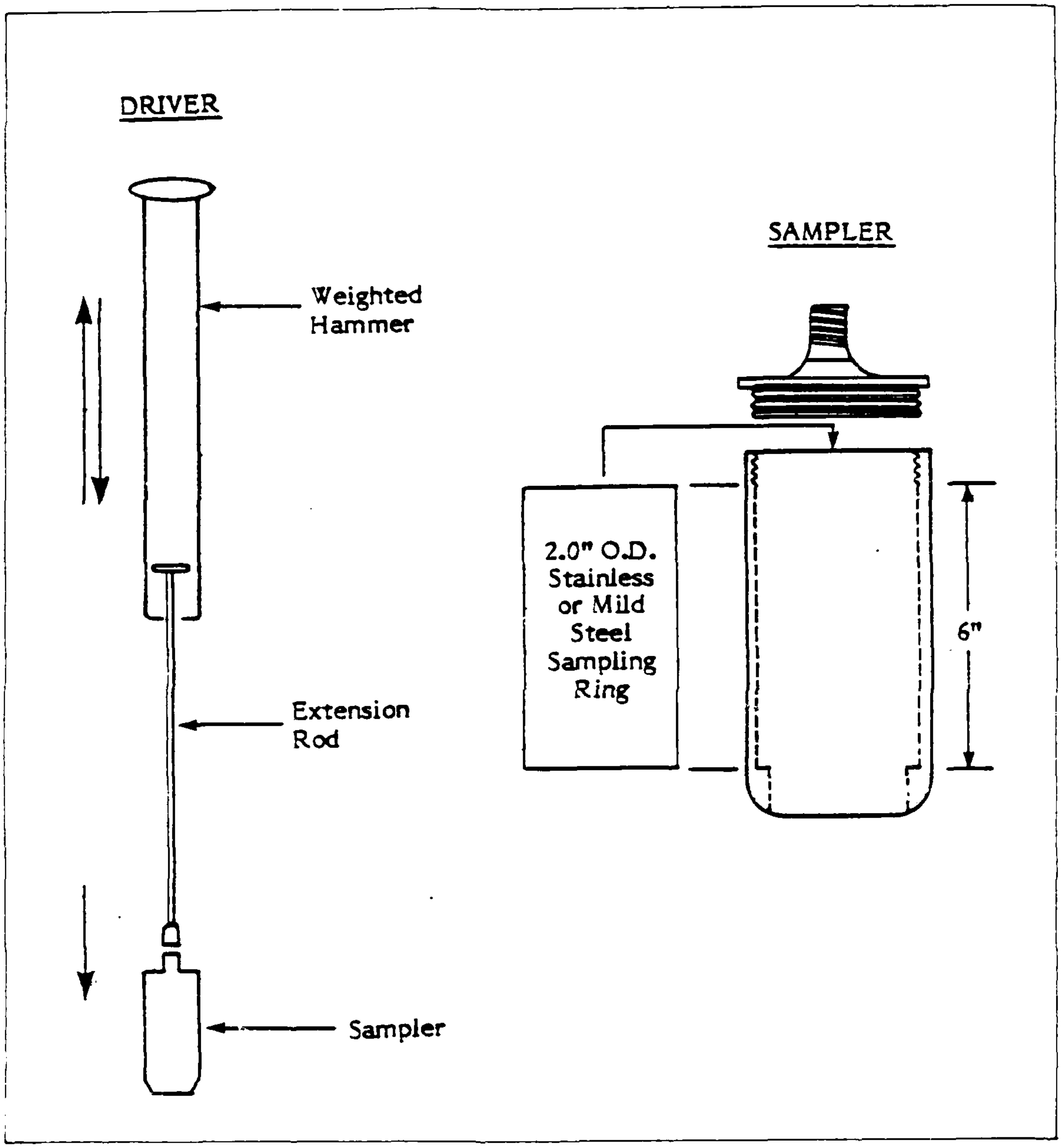



FIGURE 9-2. Hand sampling device.

Samples will be taken at each sampling location to a maximum depth of 2 feet. Samples will be divided into zero-one and one-two foot samples. Most samples will be taken in pairs (two 6-inch samples per 1-foot segment), with the top cylinder of the pair going to Acurex and the bottom cylinder to the OEHL laboratory, as a split. (This procedure is described in more detail in Section 9.1).

## 9.3 Bottom Sediment Sampling

Bottom sediment sampling will be performed using the hand sampler described in Section 9.2. For sampling locations which are beneath surface waters, a large diameter section of tubing will be driven into the sediment to be sampled to act as an outer casing. The water will then be evacuated from the casing using a pump and the sediments will be sampled using the hand sampler. The sampling team will attempt to dewater the sediments as extensively as possible to ensure sample retention in the rings. The samples will be sealed and handled as described in Section 9.1.

## 9.4 Contaminated Drill Cuttings Sampling

Samples of suspect drill cuttings will be collected by obtaining samples from the center of each drum. The sample will be collected with a disposable plastic scoop and placed directly into the sample jar. The jar will be filled and compacted to minimize air space in the jar. These samples will be tested for EP toxicity, ignitability and EPA Methods 8010 and 8020 (volatile aromatic and halogenated organics). Thorough mixing of the suspect cuttings will not be performed due to the potential for further loss of volatile organics.

# 10. GROUNDWATER MONITORING AND SAMPLING

## 10.1 Groundwater Level Measurement

The static water level in all monitoring wells will be measured as depth-to-water from a known measuring point clearly marked on each casing prior to sampling or purging the well. This level will be recorded to the nearest 0.05 foot. This method was described more fully in Section 6.2.

## 10.2 Surveying of Wells

All wells will be surveyed to determine their elevation $\pm 0.05$ foot with respect to known elevations on base. Ground surface and measuring point elevations will be recorded for each well. All new wells will also be located horizontally to an accuracy of 1.0 foot and will be recorded on both project and site-specific maps. Surveying was described more fully in Section 6.4.

## 10.3 On-Site Analysis

All water samples will be analyzed on site for pH, specific conductance and temperature. Once these parameters are stabilized, the information will be recorded in the logbook and samples for off-site chemical analysis will be collected. Please refer to Section 6.1 for a more complete description of the methodology to be used.

## 10.4 Sampling for Off-Site Analysis

Prior to collecting groundwater samples, we will purge the well using a clean submersible purge pump. During the time the well is being purged, temperature, pH, and specific conductance will be continuously monitored. Once these parameters have stabilized, usually after 3-5 well volumes, it will be assumed that the standing water from within the well casing has been purged and the water being pumped is being drawn directly from the formation surrounding the well. The purge pump will then be removed and a clean, Teflon bailer will be used to collect

the samples for lab analysis. All of the VOA samples for a given well will be collected from the first full bailer taken from the well. The bailer will be emptied with a device designed to raise the ball valve at the bottom of the bailer, allowing the water to flow out a Teflon tube at a controlled rate to minimize volatilization. Subsequent bailers of water will be used for other constituents. A stainless steel bucket will be used as a transfer vessel to allow collection of split samples. After filling the transfer vessel, sample bottles will be filled in sequence. If more than one bucket of sample water is needed, all bottles for a given lab procedure will be filled from the same bucket.

Clean bottles (meeting applicable EPA criteria for pre-use cleaning) will be provided with the appropriate preservatives. Samples to be analyzed for dissolved metals will be filtered on site by gravity or using pressurized nitrogen through a 0.45 micron glass fiber or nucleopore filter. Like the VOA samples, metal samples will not be aerated prior to filtering to keep metals in their naturally occurring states (soluble or insoluble). Filtering is done to remove 1) insoluble metals (which are not part of the lab analysis) and 2) sediment from the water so that dissolved metals do not adsorb onto clay or silt particles during storage, which would result in false readings. After filtering, the sample is acidified to keep the remaining metals in the soluble state.

The bailer and all equipment needed to purge the well will be decontaminated between wells. Sampling personnel will wear disposable gloves. Sampling will start at the least contaminated well (if that is known) and proceed to the most contaminated well. The analytical methods used by our lab (Acurex) are discussed in Chapter 13 of this report.

### 10.5 Surface Water Sampling

Surface waters will be sampled using a subsurface grab sampler, which can be submerged to a desired depth before opening the sample vessel. As with groundwater sampling, all but the VOC split samples will be taken using a transfer vessel to ensure representative duplicates. Volatile organic splits will be taken directly from the sampler vessel to reduce aeration and loss of volatiles. Samples

will be taken at a depth to be determined in the field but generally at the midpoint between water surface and benthic zone. The sampler and transfer vessel will be decontaminated between samples using the procedures described for groundwater sampling equipment in Section 11.

# 11. DECONTAMINATION PROCEDURES

## 11.1 Drilling, Soil Sampling, and Well Installation

Prior to the start of drilling, the entire drilling rig and all drilling tools will be decontaminated with a high pressure steam wash using drinking quality water. The sample barrel will also receive a steam cleaning prior to its first use and between individual holes. For multiple samples within the same hole, the sampler will be given a soap and water wash and a drinking quality water rinse between samples.

The rings used to collect soil samples will always be new. No cutting oil will be used when manufacturing the rings. Prior to sampling, a lint-free tissue will be run through the sampler to remove any moisture or dust from the inside surfaces.

All augers will be cleaned with a high-pressure steam wash using drinking quality water between holes. All PVC casing will be new and will be steam cleaned immediately prior to installation. No glues or lubricants will be used on the casing. All other well construction materials will be new.

## 11.2 Well Development

Well development will involve swabbing the well with a surge block and pumping with a submersible pump. The surge block will be cleaned with a high-pressure steam wash before and after each well. The pump and discharge line will be washed in soap and water, and rinsed with drinking quality water prior to being placed in a well casing. Care will be taken not to introduce any foreign materials into the hole during well development. The well will be purged again prior to sampling.

## 11.3 Water Level Measurements

Water level measurements will be taken with a Powers well sounder prior to purging the well for sampling. We will wash the water level probe with soap and water, and rinse it with drinking quality water between wells.

## 11.4 Water Sampling

Prior to water sampling, the well will be evacuated using a manually operated pump until temperature, pH, and conductivity are stabilized. The purge pump, which has a check valve to prevent any residual water in the pump column from back flushing into the well, will be washed and double rinsed before and after each use. The water sample for laboratory analysis will be collected using a Teflon bailer and discharged via a bottom emptying device into the appropriate sample bottle or transfer vessel. The bailer, emptying device and transfer vessel will be washed with Alconox detergent, followed by rinses with drinking-quality water and distilled water. All sampling equipment will be thoroughly air-dried after cleaning. New bailer line will be used for each well to avoid cross-contamination. Surface water sampling equipment will be washed and rinsed in the same sequence as groundwater sampling equipment.

## 11.5 Sediment Sampling

Between samples, the hand sampler will be washed with Alconox detergent, followed by a drinking-quality water rinse and a distilled water rinse. New sample rings will be used for each sediment sample.

## 12. SAMPLE HANDLING AND PACKING

### 12.1 Split Sample Procedures

Soil samples from Beale AFB will be collected using ring sampling methods described in Chapter 8. Split samples of soil will be collected for the Air Force OEHL Lab. In addition, a second split sample will be collected for 10% of the soil samples. The second split will be sent to Acurex for monitoring lab precision. The ring method provides undisturbed soil samples which have not been exposed to the atmosphere (loss of volatiles) or sampling equipment (addition of contaminants). However, the ring sampling method does not allow true split samples to be collected. A true split would require that a portion of soil be thoroughly mixed and then divided. AV will collect a split sample from the 4-6 inches of soil profile directly above or below the original soil sample. The concentration of oil and grease or pesticides/herbicides should be very similar within a 4-6 inch range of subsurface soils. This will be sufficient to provide a QA check on lab and sampling procedures.

Groundwater samples will be collected from the 20 proposed monitoring wells in two rounds of sampling, once in the wet season and once in the dry season. Groundwater will be sampled using a Teflon bailer, which will be decontaminated before each sample is collected. All samples will be split into Acurex and OEHL samples. An additional split will be made for Acurex on 10 percent of samples (if water is available in holes; low yielding wells may not produce enough water volume for 2-3 sample sets). Volatile organic bottles will be split by filling all necessary 40 ml vials successively from the same bailer. VOC samples require a minimum of disturbance, so mixing is unacceptable. We will assume that water collected within a single bailer will be homogeneous. Non-VOC samples will be collected by placing water from the bailer into an inert intermediate vessel. Once the intermediate vessel is full (and assumed homogeneous), sample bottles will be filled from that vessel.

## 12.2 Blank Sample Procedures

Water blanks will be prepared to check field procedures for potential cross contamination of groundwater samples. Field blanks will be prepared to account for up to 10 percent of water samples submitted to Acurex. These will be prepared so that the blank water (ultrapure lab water) will contact the same sampling devices as the groundwater. All sampling equipment will be decontaminated as usual and then blank water will be poured into the bailer. VOC bottles will be filled directly from the bailer. Additional water will be placed in the bailer and then into the intermediate vessel. Non-VOC bottles will be filled from the vessel. The ultrapure water will pick up any contaminants inadvertently on the sampling equipment and the chemicals will be detected in the laboratory.

## 12.3 Sample Containers

The following sample containers will be used for samples collected at Beale AFB.

- **Water (Groundwater, Surface Water)**

  VOCs: 40 ml borosilicate glass with Teflon septum
  Oil and Grease: 1 liter glass bottles with Teflon cap liners
  Petroleum Hydrocarbons: 1 liter glass bottles with Teflon cap liners
  Primary Heavy Metals: 500 ml high density polyethylene
  Pesticides/Herbicides: 4 liter amber glass bottles with Teflon cap liners
  Phenols (604): 2 liter amber glass bottles with Teflon cap liners
  Total Phenols (420.1): 1 liter amber glass bottles with Teflon cap liners
  Base/Neutral and Acid Extractables: 2 liter amber glass bottles with Teflon cap liners
  Lead: 500 ml high density polyethylene bottles

- **Soil (Soil Borings, Hand Auger)**

  Six-inch stainless steel rings (approximately 2.5 inches in diameter)

- **Cuttings**

  Eight-ounce glass jar

- **Bottom Sediment**

  Six-inch steel or brass rings (approximately 2.5 inches in diameter)

All sample containers (with the exception of the rings) will be cleaned according to EPA protocols prior to use. They will be stored in a clean, dry area with the lids on until used. The brass rings will be cut from new tubing, without cutting oil, and will be wiped out before use.

### 12.4 Sample Preservation and Storage

The following preservation and storage techniques will be used for samples collected at Beale AFB.

- **Water (Groundwater, Surface Waters)**

  VOC: Ice to $4^oC$
  Oil and Grease: $H_2SO_4$ to pH<2, ice to $4^oC$
  Petroleum Hydrocarbons: $H_2SO_4$ to pH<2, ice to $4^oC$
  Primary Heavy Metals and Lead: Filter with 0.45 micron filter, $HNO_3$ to pH<2, ice to $4^oC$
  Pesticides/Herbicides: Ice to $4^oC$
  Phenols (604): Ice to $4^oC$
  Total Phenols (420.1): 1 gram/liter $CuSO_4$, $H_3PO_4$ to pH<4, ice to $4^oC$
  B/N,A Extractables: Ice to $4^oC$

- **Soil (Soil Borings, Hand Augers, Bottom Sediments, Waste Cuttings)**

  All: Ice to $4^oC$

Upon being labeled and logged, samples will be placed immediately into coolers containing ice or a chemical coolant ("Blue Ice") to maintain sample temperatures at or near $4^{o}C$.

## 12.5 Packing Procedures

All samples collected at Beale AFB, except for drill cuttings (waste), will be packaged and shipped as low concentration samples. The sample containers will be kept cool in intermediate storage coolers until final packing. The closures on all containers will be secured with tape. For final packing, the containers will be placed in large metal coolers and the void spaces filled with vermiculite. Ice or inert chemical coolants will be placed in the cooler as will necessary chain-of-custody forms sealed in plastic. The cooler will be sealed with strapping tape, labeled as environmental samples, and shipped by overnight carrier.

Any waste samples collected at Beale will be shipped as medium concentration samples because of the presumption that they are hazardous. The sample rings will be sealed and taped, then be placed in one gallon paint cans (packed with vermiculite). The paint cans will be labeled and placed in metal cooler(s) and packed with vermiculite. The cooler(s) will be labeled as appropriate (flammable solid N.O.S. or other hazardous material labeling), meeting DOT specifications, and shipped by overnight carrier.

AV will supply the government POC with all packing materials necessary to package the selected 10% of the Air Force split samples for shipment. AV will accept for shipment the packaged AF splits and will ship via overnight delivery to USAF OEHL/SA at Brooks AFB within 24 hours of receipt from the POC.

## 13. LABORATORY CONSIDERATIONS

### 13.1 Lab Methods

AeroVironment will send the original samples collected to Acurex Laboratory in Mountain View, California, for analysis. The AV field team will also send a complete set of splits to the Air Force Lab at Brooks AFB, Texas.

Acurex will be responsible for checking sample condition upon receipt, analyzing the samples, tracking them while in their possession, and reporting the results to AV. The following analyses will be performed on Beale AFB samples:

| Analysis Method |
|---|
| VOC -- Water (601/602) |
| VOC -- Soil (8010/8020) |
| O&G -- Water and Soil (413.2) |
| Petroleum Hydrocarbons -- Water and Soil (418.1) |
| Heavy Metals -- Water and Soil (Series 200) |
| Pesticides/Herbicide -- Water and Soil (509A and 509B) |
| Phenols -- Water (604) |
| Phenols, Total -- Water and Soil (420.1) |
| B/N,A Extractables -- Water and Soil (625) |
| PCBs -- Soil (608) |
| Exploratory Scan (USATHAMA) |
| Lead -- Water and Soil |
| EP Toxicity -- Soil (40 CFR, Sub C) |
| Ignitability -- Soil (40 CFR, Sub C) |

The methods planned for these analyses are briefly outlined on Table 13-1. Table 13-2 shows detection limits, holding times and sample volume requirements.

TABLE 13-1. Analytical method description.

| | | |
|---|---|---|
| Pesticides[1] | - | Method 509a. Will determine those compounds listed in the specific method. Acurex will extract the sample by sonication. A GC-ECD will be used for the analysis. |
| Herbicides[1] | - | Method 509b. Will determine those compounds listed in the specific method. Acurex will extract the sample by sonication. A GC-ECD will be used for the analysis. |
| Volatile Organics[2] | - | Methods 601/8010 and 602/8020. Will determine those compounds listed in the specific methods. Acurex will extract the samples by Purge and Trap for each analysis, and use a GC-Hall and GC-PID for Methods 601/8010 and 602/8020. |
| Heavy Metals[3] | - | Series 200 methods. EPA-600/4-79-020. Acurex will determine As, Ba, Cd, Cr, Pb, Hg, Ag, Se. All analyses will be by atomic absorption spectrophotometry. |
| Oil and Grease[3] | - | EPA Method 413.2. Samples will be extracted with freon, concentrated and the oil and grease content determined by infrared spectrophotometry. A Perkin-Elmer, Model 299 will be used for the analysis. Soil samples will be extracted prior to analysis using Method 3550. |
| EP Toxicity[4] | - | Method 1310. Samples will be extracted using the prescribed 24-hour period. The extract will be analyzed for the 8 metals listed in the method, namely, As, Ba, Cd, Cr, Pb, Hg, Se, Ag. This method is described in SW-846. The metals will be determined by atomic absorption spectrophotometry. |
| Petroleum Hydrocarbons[3] | - | EPA Method 418.1. Similar to oil and grease analysis, but involves a step to remove animal and vegetable-derived oils and fats. Only petroleum mineral oil and greases are quantitated, by infrared spectrophotometry. Soil samples will be extracted prior to analysis using Method 3550. |

TABLE 13-1. Continued.

| | | |
|---|---|---|
| PCBs[(2)] | - | EPA Methods 608, 8080 (SW 846). Will determine polychlorinated biphenols in soil samples. Involves solvent extraction by sonication, removal of interferences with sodium sulfate and florisil, and analysis of concentrated extract by GC-ECD. |
| Phenols[(2)] | - | EPA Method 604. Will determine phenol and substituted phenols in water, using liquid-liquid acid extraction and GC-F10. |
| Total Phenol[(3)] | - | EPA Method 420.1. Will determine total phenolic content; method does not differentiate between different substituted phenols. Phenols are reacted with a color-forming agent and quantitated colorimetrically. |
| Base/Neutral and Acid Extractables[(2)] | - | EPA Method 625. Will identify and quantify a number of organic compounds which are solvent extracted in two separate fractions. The compounds are separated by gas chromatography and eluted into a mass spectrometer for identification and quantitation based upon calibration standard response factors. Soil samples will be extracted by sonication. |
| General Explosives Scan | - | USATHAMA. Will determine the presence of explosive constituents in soil. |
| Ignitability[(4)] | - | Flash point test will determine whether a sample is classified as an ignitable waste (F.P. $\leq 140^{\circ}$F). |

[(1)]Standard Methods for the Examination of Water and Wastewater, American Public Health Association, 1015 Fifteenth Street NW., Washington, DC 20005, 15th Edition.

[(2)]Methods for Organic Chemical Analysis of Municipal and Industrial Water, U.S. EPA, Federal Register, Vol. 29, 26 October 198-.

[(3)]Methods for Chemical Analysis of Water and Wastes, U.S. EPA, Environmental Monitoring and Support Laboratory, Cincinnati OH 45268, EPA 600/4-79-020.

[(4)]Test Methods for Evaluating Solid Waste, U.S. EPA, Office of Solid Waste Management and Emergency Responses, Washington, DC 20460, July 1982, 2nd Edition.

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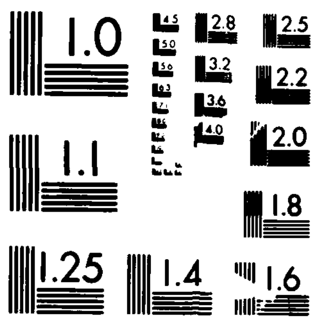
1.0
1.1
1.25
1.4
1.6
1.8
2.0
2.2
2.5
2.8
3.2
3.6
4.0

TABLE 13-2. Beale AFB analytical summary.

| | METHOD | DESCRIPTION | DETECTION LIMIT | HOLDING TIME | PRESER-VATION | SAMPLE VOLUME | SECOND COLUMN CONFIRMATION |
|---|---|---|---|---|---|---|---|
| **WATER** | | | | | | | |
| Volatile Organics | 601<br>602 | Purgeable Halocarbons<br>Purgeable Aromatics | As specified in methods | 14 days<br>14 days | 4 deg C | 40 ml<br>40 ml | See Appendix A |
| Oil & Grease | 413.2<br>3550 extraction | Determination of oil and grease content | 100 ug/L | 28 days | H2SO4 to pH 2<br>4 deg. C | 1 liter | |
| Petroleum Hydrocarbons | 418.1<br>3550 extraction | Total petroleum hydrocarbon compounds | 100 ug/L | 28 days | H2SO2 to pH 2<br>4 deg. C | 1 liter | |
| Pesticides | 509a | Organochlorine Pesticides | See Appendix 12A | 7 days | 4 deg. C | 2 liter | See Appendix A |
| Herbicides | 509b | Phenoxy Herbicides | See Appendix 12A | 7 days | 4 deg. C | 2 liter | See Appendix A |
| Heavy metals (8), Lead | 200 Series<br>EPA600/4-79-020 | Hg, Se, Ag,<br>As, Ba, Cd, Cr, Pb | See Appendix 12A | 28 days Hg<br>6 mths others | HNO3 to pH 2<br>4 deg. C | 500 ml | |
| Phenols | 604 | Phenol and 10 subst. phenols GC method | As specified in method | 7 days | 4 deg. C | 2 liters | See Appendix A |
| Phenolics, total recoverable | 420.2 | Total phenolic content Colorimetric method | 5 ug/L | 24 hours | 1 g/L CuSO4,<br>H3PO4 to pH 2<br>4 deg. C | 1 liter | |
| B/N, A Extractables | 625 | Organic compounds extractable in organic solvent, GC/MS | As specified in method | 7 days | 4 deg. C | 2 liter | |
| **SOIL** | | | | | | | |
| Volatile Organics | 8010<br>8020 | Halogenated Volatile Organics<br>Aromatic Volatile Organics | As specified in method | 14 days | 4 deg. C | Sample Ring | See Appendix A |
| Oil & Grease | See water | See water | 100ug/g | 28 days | 4 deg C | Sample ring | |
| Petroleum Hydrocarbons | See water | See water | 100ug/g | 28 days | 4 deg. C | Sample ring | |
| Heavy metals EP Toxicity | See water<br>1310 | See water<br>Extraction Procedure Toxicity | See water | See water | 4 deg C | Sample ring | |
| Pesticides Herbicides | See Water | See water | See water | See water | 4 deg. C | Sample ring | See Appendix A |
| Total Phenol | See water | See water | 1 ug/g | See water | 4 deg. C | Sample ring | |
| PCB's | 608/8080 | Organochlorine pesticides and PCB's | 1 ug/g | 7 days | 4 deg C | Sample ring | |
| B/N, A Extractables | See water | See water | See water | See water | 4 deg. C | Sample ring | |
| Explosives Scan | USATHAMA | Test for general explosives | As specified in method | | 4 deg. C | Sample ring | |
| Ignitability | 40CFR 261.21 | Test for characteristics of ignitability (flash pt.) | N/A | | 4 deg. C | | |

### 13.2 Laboratory QA/QC Procedures

The general quality assurance program for the Energy and Environmental Division of Acurex has been presented in the appendix of AeroVironment's original Air Force contract proposal under the title, "Environmental Quality Assurance Program Plan." Details specific to this project are given here. The guidelines that will be used are found in two U.S. EPA source documents[1,2]. By applying the QA/QC guidelines put forward in these two documents, laboratory QA/QC activities will normally include:

- Use of EPA-acceptable sample preparation and analytical methods.
- Routine calibration of laboratory instruments and the use of reference standards as necessary.
- Periodic inspection, maintenance and servicing of all laboratory instruments and equipment.
- Use of reference standards and QC samples to determine the accuracy and precision of procedures, instruments, and operators.
- Use of adequate statistical procedures to monitor the precision and accuracy of the data.
- A continuous review of the results to identify and correct problems.
- Documentation of the performance of systems and operators.

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[1] U.S. EPA (1982): Test methods for evaluating solid waste. Report No. SW 846, 2nd edition. Office of Solid Waste and Emergency Response.

[2] U.S. EPA (1979): Handbook for analytical quality control in water and wastewater laboratories. Report No. EPA-600/4-79-019, Environmental Monitoring and Support Laboratories, Cincinnati, Ohio.

- Regular participation in external laboratory evaluations.

- Use of acceptable sample identification and, as necessary, formal chain-of-custody procedures in the laboratory.

- Maintenance and storage of complete records, charts, and logs of all pertinent laboratory calibration, analytical, and QC activities and data.

- Presentation of all data outputs in their prescribed format.

QC activities associated with individual analyses are given in the referenced documents. In general, this includes analyzing one method blank per sample batch, with a minimum frequency of one per twenty samples. In addition, one duplicate sample for every ten will be run, as well as one standard (where applicable) per twenty samples. Also, where applicable (e.g. for atomic absorption analysis of lead, cadmium, etc.), multi-point calibrations will be employed.

For gas chromatographic analyses of organics, when specified analyte concentrations exceed the detection levels identified in Appendix B, second column confirmation will be performed. Results will not be reported for an analyte unless retention times on both columns match.

### 13.3 Data Presentation

Analytical results will be reported to the Air Force as part of the final report for the Phase II, Stage I activities. We will include the analytical results and QA/QC summaries for each sample batch in an appendix of the report. QA/QC test details will not be included in the report, but will be available for review as needed. The results presented to AV from the laboratory will be reviewed by AV chemists to check QA results, holding times, chain of custody, etc. to ensure that data are valid before they are used in the data analysis and conclusions sections of the report.

The data from the laboratory will be presented in two forms in the text of the report. First, AV will provide a tabular summary of analytical results for all soil, water and ash samples. These tables will be arranged according to sampling location and will be keyed to the sample codes assigned in the field. Second, we will provide a graphical presentation of results, showing trends and/or area distributions with graphs, charts or figures. Only the most descriptive results will be included in the graphical presentation, eliminating insignificant results to provide an easily digestible presentation.

All raw analytical data will be retained by Acurex for a period of 1 year, and will be available to USAF at any time within this period upon request.

## 14. SITE CLEAN-UP

All noncontaminated bore hole cuttings will be removed and the general area will be cleaned following the completion of each well or boring. Cuttings suspected of being hazardous waste (based on discoloration, odor, or organic vapor meter readings) will be containerized in clean 55-gallon drums with removable tops and band closures. Suspected hazardous waste will be sampled and analyzed at the lab for E.P. toxicity and ignitability to determine the actual hazard and disposal required. Ultimate disposal of material determined to be hazardous will be through base personnel.

## 15. FIELD TEAM ORGANIZATION AND RESPONSIBILITIES

### 15.1 Organization

AeroVironment will manage and be present for all aspects of the field program at Beale AFB. AV will subcontract Water Development Corporation of Woodland, California, to provide drilling, well construction, and well development assistance to this task. Water Development has been selected by AV on the basis of past experience and competitive price bidding. Acurex Corporation will be subcontracted to provide laboratory analysis of soil, water, ash, and waste samples. The project organization is shown in Figure 15-1.

Douglas Taylor will serve as project manager. Mr. Taylor, a registered civil engineer, serves as a project manager for AeroVironment on hazardous waste and leaking storage tank assessments. He has extensive experience in characterizations of known and suspected hazardous waste sites. He currently provides technical leadership to the AV hazardous waste field team. In his previous employment, he was the preliminary assessment group leader for EPA's Region 8 field investigation team contractor.

The drilling and well installation will be supervised by Timothy O'Gara. Mr. O'Gara is a hydrogeologist with AV and served as the field geologist for AV's drilling programs at Williams AFB (Phase II, Stage I, IRP) and Mather AFB (Phase II, Stage II, IRP). Mr. O'Gara has previously served as resident geologist at the initial closure of the Stringfellow Quarry hazardous waste site. He also has project experience with water well design for domestic drinking water supplies.

Laboratory interface, data validation and sample tracking oversight will be conducted by Christopher Lovdahl. Mr. Lovhdahl recently joined AeroVironment from Cadillac Motor Company. At Cadillac he served as an analytical chemist utilizing gas chromatography, GC/MS, HPLC and other equipment for water and waste analysis. In a previous position at Cadillac, Mr. Lovdahl was responsible for plant-level waste management, sampling and RCRA compliance at three manufacturing plants.

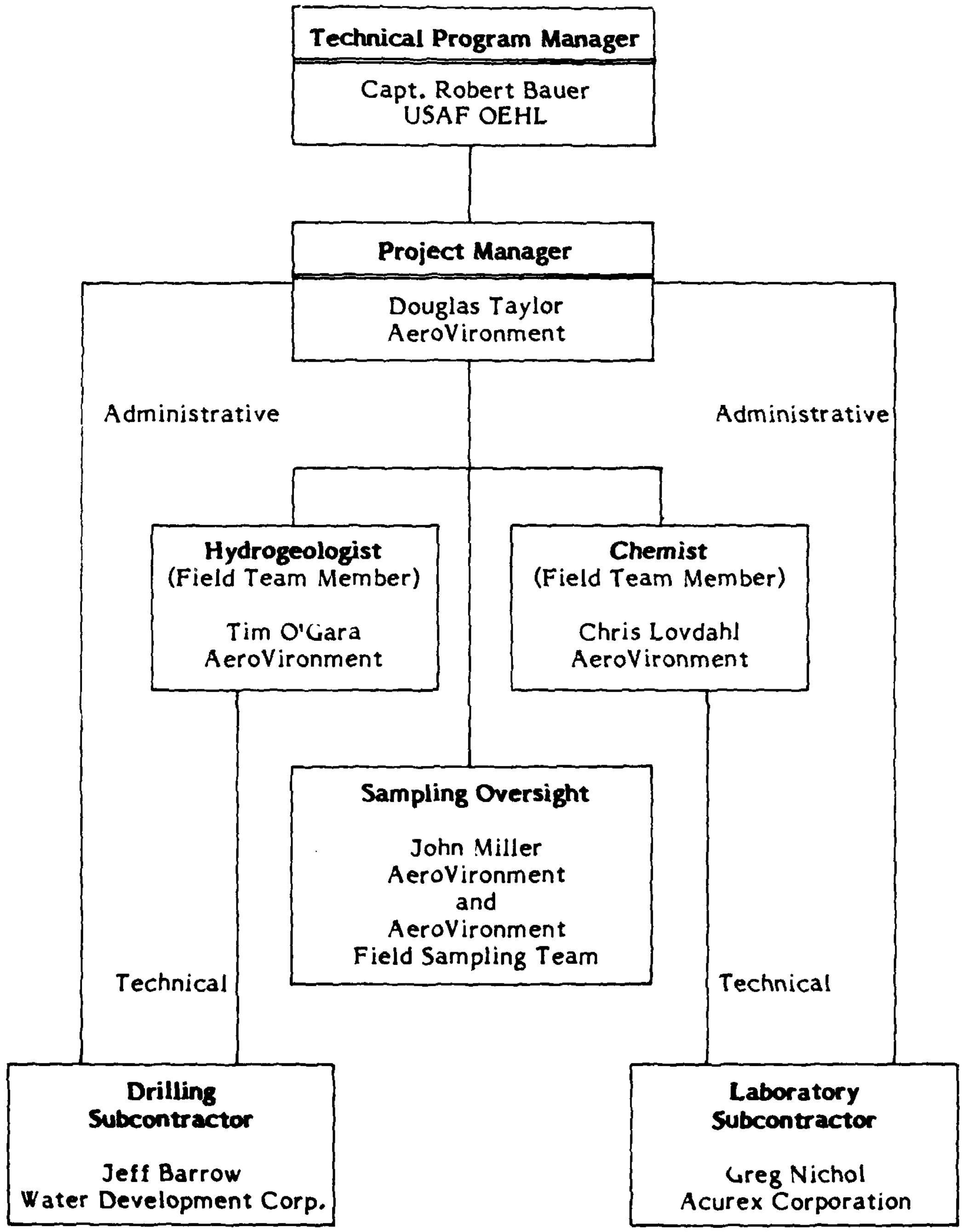


FIGURE 15-1. Project organization.

Sample collection will be monitored by Mr. John Miller. Mr. Miller has extensive background in designing and implementing soil sampling programs on drilling, environmental and exploration projects. Prior to joining AeroVironment, Mr. Miller served as a geochemist with Anaconda Minerals Company in Denver. There he was responsible for statistical sampling design, QA/QC and laboratory interface and evaluation of the movement of contaminants through saturated and unsaturated zones.

### 15.2 Responsibilities

As project manager, Mr. Taylor will be responsible for all aspects of the Phase II, Stage I survey at Beale AFB. He will manage AV personnel throughout field work and report preparation. He will also administer drilling and laboratory subcontracts and will oversee cost and schedule compliance. Mr. Taylor will serve as a member of the field team during start-up and sampling.

Mr. O'Gara will be responsible for drilling, soil sampling and well installation/development. He will direct the activities of the drilling crew, select monitoring well design and log all geologic samples collected. He will also prepare report sections on environmental setting, field activities and hydrogeology. Mr. O'Gara will also serve as site safety officer.

Mr. Lovdahl will be responsible for ensuring that appropriate sampling methods are used and that samples are properly prepared for laboratory analysis. After field work is completed, he will provide QA/QC review of Acurex analytical reports and provide chemical interpretation of sampling results.

Mr. Miller will help to design and conduct the hand sampling program for surface soil. He will also be responsible for the soil sample collection from augering activities and will ultimately review data to evaluate subsurface geochemical conditions.

The basic field team will be supplemented by AeroVironment field technicians during labor intensive activities such as well evacuation, groundwater sampling and surface soil/water sample collection.

## 15.3 Training

AeroVironment's field crew has been fully trained in health and safety aspects of working at known or suspected hazardous waste sites. This training included eight hours each of basic first aid and cardiopulmonary resuscitation and a minimum of eight hours of site safety, protective clothing use and respiratory protection with air purifying respirators. In addition, the key field personnel have had an additional thirty-two hours of training in sampling, field activities, hazardous materials handling, instrument operation and use of self-contained breathing apparatus (SCBA).

Mr. Taylor, Mr. O'Gara and Mr. Lovdahl have all worked on numerous known or suspected hazardous waste sites. Almost all of their field experience included collection of environmental samples from water and soils as well as waste samples. AV provides periodic training updates for field personnel both in-house and at seminars. Mr. O'Gara recently completed a National Water Well Association course on groundwater sampling methods.

## 15.4 Safety

AeroVironment has prepared a site-specific safety plan for the subject field work. This plan was required by Air Force OEHL and by AV's corporate health and safety (H&S) program. The site safety officer will be responsible for ensuring compliance with the safety plan. The site safety officer will also make sure that subcontractor personnel are properly safety trained for their assigned duties and that they adhere to the safety plan.

In addition to completing the site safety plan, AV's corporate H&S program requires that employees undergo biological monitoring. Field employees are given extensive medical examinations to check that they are healthy enough to wear respiratory protective equipment and undergo potential stress from physical and chemical agents. Monitoring is also conducted to identify potential exposures to hazardous materials. AV has an emergency medical system to handle injuries or exposures at the field site.

Field personnel will monitor air conditions in breathing zones throughout the field project. Air will be monitored for organic vapors, oxygen deficiency and explosive gases. The organic vapor meter will be used to monitor volatile organic contamination in soils, measure downhole organic vapors during drilling and to check ambient air for worker safety. The following action levels will be set for work at Beale:

Organic Vapors:

- 0-5 ppm above background: normal work
- 5-50 ppm above background: use air purifying respirators
- >50 ppm above background: use SCBA
- >100 ppm above background: stop work and consult with company safety and base personnel

Oxygen Content:

- 19.5-25.0%: work is okay
- <19.5%, >25%: no work

Explosimeter:

- <20% L.E.L.: work is okay
- >20% L.E.L.: no work

Field workers at Beale AFB are not expected to need respiratory protection. After reviewing the site conditions, hazards from mechanical injury associated with drilling and working in rough terrain are considered to be more probable than chemical exposure.

## 16. SCHEDULE

The anticipated schedule for Phase II, Stage I study at Beale AFB is shown in Figure 16-1. The schedule shows a field start date of October 21, 1985. Field work for the winter season should be completed by the end of the calendar year. Planning has been done to try to complete drilling and augering in difficult access areas during the initial weeks of the program. We will attempt to minimize the potential delays caused by the rainy season which typically starts in mid-November.

We expect a six week field drilling effort at Beale AFB. An additional two weeks will be required to collect groundwater samples from the newly completed wells. Surface water, sediment and surface soil samples will be collected at the same time as other field activities are being conducted. The second round of groundwater samples will be collected in June of 1986, and should take about two weeks to complete. Sample analyses should be completed six weeks after receipt from the field. AV will begin intensive report preparation when the first round of analytical data is available for review and interpretation.

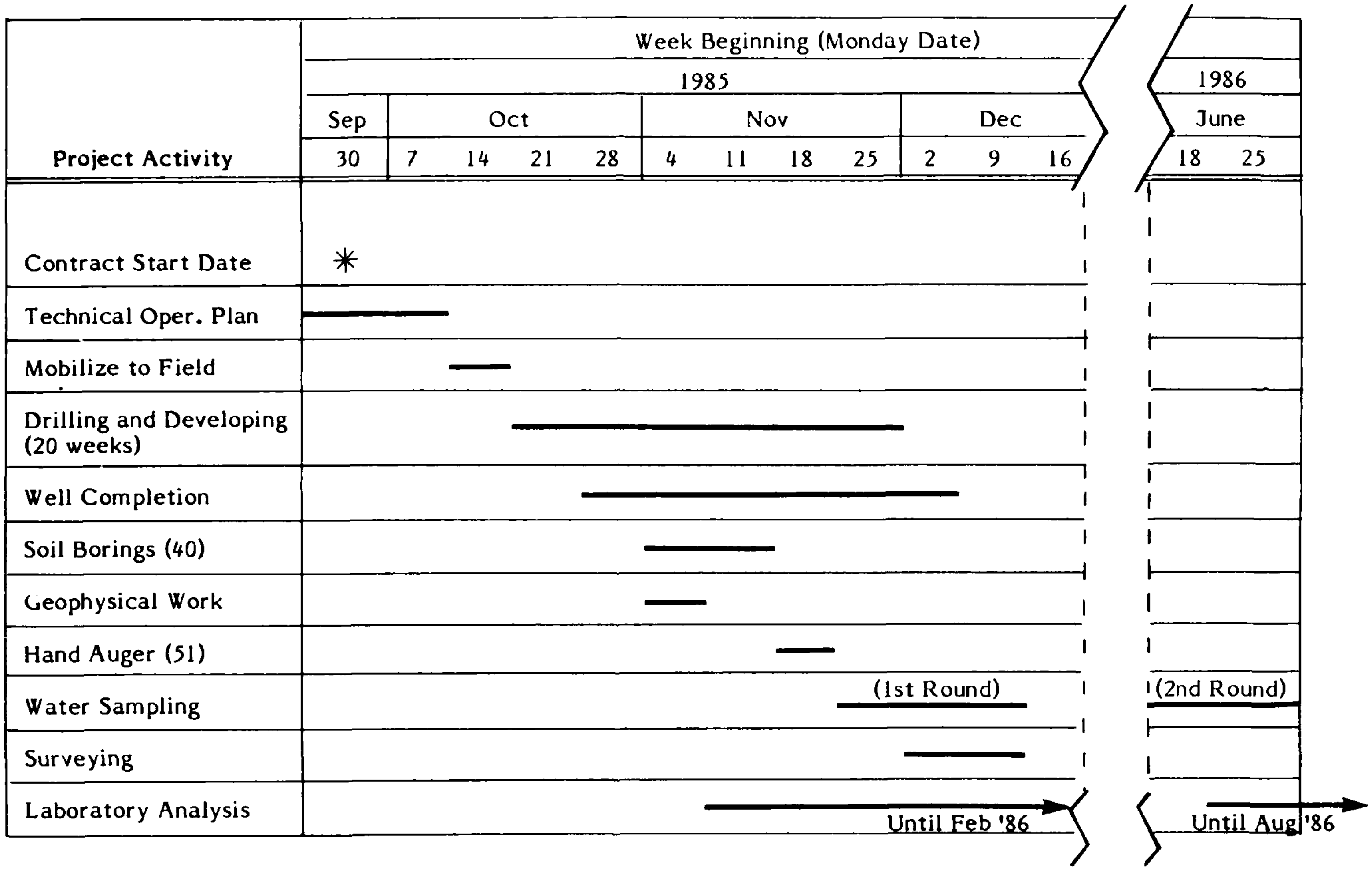


FIGURE 16-1. Proposed schedule Beale AFB.

# APPENDIX A

Statement of Work

10416 K

16 AUG 1985

Installation Restoration Program
Phase II (Stage 1), Beale AFB, CA

I. The overall objective of the Phase II investigation is to define the magnitude, extent, direction, and rate of movement of identified contaminants in the ground water. A series of staged field investigations may be required to meet this objective. The contractor shall recommend any additional investigations required beyond this stage including an estimate of costs.

The purpose of this task is to undertake a field investigation at Beale AFB CA: (1) to determine the presence or absence of environmental contamination within the specified areas of investigation; (2) if contamination exists, to determine the potential for migration of these contaminants in the various environmental media; and (3) to identify potential environmental consequences and health risks of migrating pollutants based on applicable local, state and/or federal standards.

The Phase I IRP report (mailed under separate cover) incorporates the background and description of the sites for this task.

A. The contractor shall be required to perform the following general specifications in association with the accomplishment of the individual tasks of this contract unless otherwise identified in the task specific work:

1. Determine the aerial extent of each site by reviewing available aerial photos of the base, both historical and the most recent panchromatic and infrared, and by field reconnaissance.

2. Inventory all wells on base (active, inactive, abandoned) and include map with locations in an appendix of report.

3. Permanently mark each location where surface water, soil, or sediment samples are taken. Record and document the location on a project site map.

4. Wells shall be completed and installed as follows:

a. Monitor all well drilling and exploratory borehole operations with a photo-ionization meter or equivalent organic vapor detection device to identify potential generation of hazardous and/or toxic materials. In addition, the contractor shall monitor drill cuttings for discoloration and odor. During drilling operations, if soil cuttings are suspected to be hazardous, the contractor shall containerize them in new, unused drums and test them for EP Toxicity and Ignitibility. The results of these tests shall be included in boring logs. A maximum of 12 samples shall be collected for EP Toxicity and Ignitibility testing. In addition, the contractor shall comply with all applicable EPA, AFOSH, OSHA, State and any other agencies regulations/procedures concerning safety during drilling and sampling and analysis procedures. If required, a safety plan shall be directly filed with the agencies.

b. Well completion shall comply with U.S. EPA publication 330/9-51-005, NEIC Manual for Ground Water/Subsurface Investigations at Hazardous Waste Sites and State of California requirements for monitoring well installation. Only screw type joints shall be used. Glued fittings are not permitted.

c. The exact location and number of monitor wells, borings and augerings for each site shall be determined in the field by the contractor in consultation with the OEHL project manager. The approximate locations and recommended number and depth of wells (including screening lengths), borings and augerings for sites under investigation are given in the site specific section of the task. Monitor wells and borings at all landfill sites shall be drilled around the perimeter and outside of the landfill areas.

d. Drill all wells using ~~hollow-stem auger~~ use air rotary w/ casing hammer or equivilent equipment. With the hollow-stem auger method, a center stem, plug, and bit attached to the stem may be inserted into the auger for use while drilling. This will prevent material from entering into the hollow stem of the auger. Collect soil or core samples (using split-spoon or shelby tube sampler or by collecting continuous core from surface over the sampling interval) for stratigraphic control purposes at 5-foot intervals, (unless otherwise specified in site specific work). Record and store these samples for one year. Include pilot boring log and well completion summaries in the Final Report, (as specified in Item VI below).

e. Total footage of all wells in this task shall not exceed 2600 linear feet. Drill a maximum of 20 wells. Maximum depth of each well shall not exceed 130 linear feet. After identifying the saturated zone, a four-inch, 20-foot long, stainless steel screen shall be emplaced below the water table surface with a four-inch, 10-foot long, stainless steel casing above the screen. The remainder of the well shall be completed with four-inch diameter low carbon steel casing, using threaded nonglued fittings from the stainless steel casing section to the land surface. Total screening for all wells in this task shall not exceed 400 linear feet. The screen shall consist of four-inch diameter, stainless steel. Cap the screen at the bottom. All connections shall be flush-joint threaded.

1) Gravel pack the annulus of the screened zone with washed and bagged rounded sand or gravel with a grain size distribution compatible with the screen and formation. Place the gravel pack from the bottom of the borehole to five feet above the tip of the well screen. Granulated or pelletized bentonite shall be tremied above the gravel pack to a thickness of feet. Insure the bentonite forms a complete seal. Pump grout the remainder of the hole to land surface with a grout mixture of 6:1 Type 1 Portland cement ("9" sack mixture) and bentonite powder.

2) Complete each well with a cap and locking hasp and clearly number each well with an exterior paint or metal die stamp. If the base determines the well is in an area which needs protection, install three three-inch diameter steel guard post radially away from each wellhead. Each guard post shall be six feet in total length. Recess the guard post two feet into the ground and insure they are removable. Provide a locking mechanism to prevent unauthorized removal.

3) If base officials determine the well stick-up is a concern in an area, complete the well flush with the land surface. Cut the well casing two to three inches below land surface. Complete the flush to ground installation by cementing a cast-iron locking lid and valve box assembly around the well. Insure that free drainage is maintained within the valve box to prevent infiltration of surface water. A maximum of 6 wells shall be considered for flush land surface installation.

f. Following completion of each well, the well shall be developed to provide maximum yield and sand-free conditions. Development of the wells shall be accomplished using a submersible pump, except, where insufficent water is available a bailer shall be used.

g. Determine by survey the elevations of all newly installed monitoring wells to an accuracy of +0.05 feet with respect to a base bench mark. Horizontally locate all wells to an accuracy of one foot. Record the positions on both project and site maps. Bench marks used must have been previously established from and are traceable to a USCGS/USGS survey marker.

h. Measure water levels at all monitoring wells as feet below the ground surface or below the top of the casing elevation to the nearest 0.01 foot. Record elevations as mean sea levels. Measure static water levels in wells using an electric tape prior to each round of sampling and at the time of well development after the water level has stabilized. A potentimetric surface map shall be generated each time static water levels are collected.

5. Evaluate available techniques for well abandonment that are applicable to the type of monitoring wells and geological conditions for Beale AFB. This evaluation shall consider that these wells shall be abandoned at some future date after the study objectives have been met and there is no longer a need for the wells. Provide recommendations for candidate method(s) or technique(s) to apply, including relative costs. The actual process of well abandonment is not a part of this study or Air Force activities at this time.

6. Drill a maximum of 39 shallow exploratory borings using hollow-stem auger or equivalent technique. The total footage of the exploratory borings shall not exceed 620 linear feet. Each exploratory boring shall not exceed 15 linear feet unless otherwise specified in site specific tasks. Soil samples shall be collected using a stainless steel split-spoon sampler (ASTM Method D-1536). Soil samples shall be collected at 5-foot intervals, (unless otherwise specified in site specific tasks), and at any major soil interface. Two soil samples per borehole shall be collected for chemical analysis, unless otherwise specified in site specific task. All remaining soil samples from each borehole shall be archived frozen and maintained for possible future analysis. Soil samples shall be maintained for the duration of the contract effort. Upon completion of operations at each boring grout the borehole from bottom of the hole to the land surface in order to prevent downhole contamination.

7. Sampling and analysis shall be conducted as follows:

a. All water samples (ground water) shall be analyzed on site by the contractor for pH, temperature and specific conductance. Sampling, maximum holding time and perservation of samples shall strictly comply with the following references: Standard Methods for the Examination of Water and Wastewater, 15th Ed. (1980), p. 35-42; ASTM, Section 11 Water and Environmental Technology; Methods for Organic Chemical Analysis of Municipal and Industrial Wastewater, EPA Manual 600/4-79-020, pp. xiii to xix (1979). All chemical analyses (water and soil) shall meet the required limits of detection for the applicable EPA method identified in Attachment 2.

b. Purge wells prior to sampling. Purging shall be complete when the pH, temperature, specific conductance, color and the odor of the discharge are noted to stabilize and at least three well volumes have been displaced. Conduct purging operations using a submersible pump and all sampling using a Teflon bailer. As the first step of ground water sampling operations at each well, collect static water level measurements to an accuracy of 0.01 feet with respect to an established surveyed marked point on the well casing.

c. All groundwater and surface water samples shall be collected twice, (ideally once in the wet and once in the dry season) at two different synoptic periods. Soil boring, bottom sediment and hand auger samples shall be collected for analysis only once (at first synoptic period).

d. Locations where surface water or sediment samples are taken, or where soil exploratory borings are drilled shall be marked with a permanent marker, and the location marked on a project map of the site.

e. Field data collected for each site shall be plotted and mapped. The nature, magnitude, and potential for contaminant flow within each zone to receiving streams and groundwaters shall be estimated. Upon completion of the sampling and analysis, the data shall be tabulated in the next R&D Status Report as specified in Item VI below. All raw data shall remain in the lab for one year, and will be provided to USAF upon request.

f. All ground water samples shall be split in the field. One set of samples shall be analyzed by the contractor and the other set of samples shall be delivered immediately, (the same collection day), to the field government point of contact (POC). The field POC will select 10% of the split samples for subsequent shipment and analysis and deliver them to the contractor within 24 hours of receipt. The contractor shall supply all packing and shipping materials for the field POC's use in packaging the split samples. The contractor shall accept from the field POC the packaged

samples for immediate shipment (within 24 hours) for analysis through overnight delivery to:

USAF OEHL/SA
Bldg 140
Brooks AFB TX 78235-5501

The samples sent to the USAF OEHL/SA shall be accompanied by the following information:

(1) Purpose of sample (analyte)
(2) Installation name (base)
(3) Sample number (on containers)
(4) Source/location of sample
(5) Contract Task Numbers and Title of Project
(6) Method of collection (bailer, suction pump, air-lift pump etc.)
(7) Volumes removed before sample taken
(8) Special Conditions (use of surrogate standard, special nonstandard preservations, etc.)
(9) Preservatives used
(10) Date and time of sampling
(11) Sampler's name

Forward this information with each sample by properly completing an AF Form 2752 (copy of form and instruction on proper completion mailed under separate cover). In addition, copies of field logs documenting sample collection should accompany the samples.

Maintain chain-of-custody records for all samples, field blanks, and quality control duplicates.

e. Second-column confirmation shall be required when detection limits exceed values identified in Attachment 2, for EPA Methods 601, 602, 608, 8010, 8020 and Standard Methods 509A and 509B. Conduct second-column confirmation on a maximum of 50% of the samples collected for these analyses.

f. Include second column confirmation results in the report. These shall include what columns were used, conditions, and the two different retention times for major components.

g. Analyze an additional 10% of all samples, for each parameter identified, for field quality control purposes, as indicated in Attachment 1. Include all quality control procedures and data in final reports.

h. Summarize sampling methods used, detection levels, and holding times in a table included in the Appendix.

i. Internal quality control procedures and data (lab blanks, lab spikes, and lab duplicates) as well as field quality control data shall be included in the draft finals reports.

8. Decontamination Procedures:

a. All sampling equipment, including components of sampling interface, shall be decontaminated prior to use between samples, and between sampling locations to avoid cross-contamination. Sampling equipment and interface shall be thoroughly washed with a laboratory-grade detergent followed by clean water, solvent (methanol) and distilled water rinses. Sufficient time shall be allowed for the solvent to evaporate and for the equipment to dry completely. The monofilament line or steel wire used to lower bailers into the well shall be dedicated to each well or discarded after each use. The calibrated water level indicator for measuring well volume and fluid elevation must be decontaminated before use in each well.

b. The drilling rig and tools shall receive thorough initial cleaning and be decontaminated after each borehole. As a minimum, drill bits shall be steam cleaned after each borehole is installed. Drilling shall proceed from the "least" to the "most" contaminated areas, if possible.

9. Conduct a literature search to complement the Phase I report (mailed under separate cover) for local hydrogeologic conditions. Data generated in this literature search shall complement Phase I Report data such that the following list will be complete. This list of data shall be utilized by the contractor to pinpoint well locations, sampling points, etc. In addition, this data shall be included in Appendix D of the Final Report of this effort.

a. Topographic data

b. Geologic data

(1) Structure

(2) Stratigraphy

(3) Lithology

c. Hydrologic data

(1) Location of existing wells, observation holes and springs within a one-mile radius of sites to be investigated

(2) Groundwater table and piezometric contours

(3) Depth to water

(4) Quality of water

(5) Recharge, discharge and contributing areas

d. Data on existing wells, observation holes, and springs within a one-mile radius of sites to be investigated

(1) Location, depth, diameter, types of wells, and logs

(2) Static and pumping water level, hydrographs, yield, specific capacity, quality of water

(3) Present and projected groundwater development and use

(4) Corrosion, incrustation, well interference, and similar operation and maintenence problems

(5) Location, type, geologic setting, and hydrographs of springs

(6) Obseration well networks

(7) Existing water sampling sites

e. Aquifer data

(1) Type, such as unconfined, artesian, or perched

(2) Thickness, depths, and formational designation

(3) Boundaries

(4) Transmissivity, storativity, and permeability

(5) Specific retention

(6) discharge and recharge

(7) Ground and surface water relationships

(8) Aquifer models

f. Climatic data

(1) Precipitation

(2) Evapotranspiration

10. All well drilling, development, purging, and sampling methods must conform to State and other applicable regulatory agencies requirements. Include in the Appendix the names of all approving State and other regulatory personnel and dates that they accepted drilling techniques, well development, purging, and sampling methods.

11. Plot and map field data for each site. Estimate the nature of contamination and the magnitude and potential for contaminant flow within each site to receiving streams and ground waters. Upon completion of the sampling and analysis, tabulate the data in the next R&D Status Report (Atch 1, Sequence 1 as specified in Item VI).

B. The following are the site specific task to be accomplished in this contract effort: (Attachment 1 identifies site components and samples to be collected.)

1. Site 1. Discharge Area No. 1 (DA-1) - West Drainage Are

a. Install one ground water monitoring well according to Section I. A. 4. in an area immediately adjacent to the site in a downgradient (southwesterly) direction.

b. Collect ground water samples from the well according to Section I.A.7. Analyze each ground water sample for the analytes indicated in Table 1 under DA-1.

c. Collect one surface water, bottom sediment and two-foot hand auger core sample from four locations along the unnamed creek into which DA-1 discharges. Take three sets of samples downstream of the oil-boom installed by base personnel and one set within the oil-boom to establish a "worst case" scenario. One sampling point shall be located where the unnamed creek crosses the base boundary. The samples shall be analyzed for the parameters listed in Table 1 under DA-1.

d. Also, collect one groundwater sample from each of the nine Base Production Wells according to Section A.7. Analyze each groundwater sample for the analytes listed in Table 1 under DA-1.

2. Site 2. Injection Well No. 2, (INJ-2).

a. Install one groundwater monitoring well according to Section I.A.4. Determine the exact location in the field, but generally locate the well in a downgradient direction between injection wells 1 and 2.

b. Collect groundwater samples from the new and existing monitoring well. Collect samples according to Section I.A.7., and analyze for parameters listed in Table 1 under INJ - 2.

c. Drill four exploratory soil borings according to Section I.A.6. Place one boring downgradient and in close proximity to each of the three injection wells. Locate one boring upgradient from the injection wells to establish background conditions. The exact location of the borings shall be determined in the field.

d. Select two of the four soil samples collected in each exploratory boring for a maximum of eight soil samples, and analyze the samples for the paraameters listed in Table 1 under INJ - 2.

e. Select a maximum of 3 soil samples from the sampling intervals at groundwater interfaces collected in the process of well installation, and analyze the samples for the parameters listed in Table 1 under INJ - 2.

f. Collect one groundwater sample from the four existing monitoring wells ground the photowaste sludge ponds according to Section I.A.7. Analyze each ground water sample for parameters listed in Table 1 under INJ - 1.

3. Site 3. Fire Protection Training Areas No. 1 and 2 (FPTA 1 & 2)

a. Install five ground water monitoring wells according to Section I.A.4. Determine the exact location in the field, but the wells shall encircle the area of FDTA 1 & 2.

b. Collect groundwater samples from each well according to Section I.A.7. Analyze each ground water sample for the analytes listed in Table 1 under FPTA 1 & 2.

c. Drill eight exploratory soil borings according to Section I.A.6. Place three borings within each fire training area, to determine the vertical extent of soil contamination. Locate one boring upgradient from fire training area to establish background conditions and one downgradient of underground storage tanks. The exact location of the borings shall be determined in the field.

d. Select three of the four soil samples collected in each exploratory boring for a maximum of 24 soil samples from the borings and analyze them for the parameters listed in Table 1 under FPTA 1 & 2.

e. Collect two bottom sediment samples from the overflow pond and analyze them for the parameters listed in Table 1 under FPTA 1 & 2.

2'

f. Collect two core samples with a hand auger within the overflow collection pit, and three core samples from downstream locations within the drainage ditch receiving drainage from overflow collection pit. The core samples shall be subdivided into zero-one and one-two foot intervals for a total of ten core samples. The ten core sample shall be analyzed for parameters listed in Table 1 under FPTA 1 & 2.

4. Site 4. Discharge Area No. 2 (DA-2) - Battery Shop Dry Well

a. Install one ground water monitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direction from the site.

b. Collect groundwater samples from the well according to Section I.A.7. Analyze each groundwater sample for the analytes listed in Table 1.

c. Soil samples shall be collected in the well installation at the ~~10,~~ 15, 20, 25 and 30 foot intervals, and analyzed for the parameters listed in Table 1 under DA-2.

d. Drill one exploratory soil boring to 30 linear feet according to Section I.A.6. Determine the exact location in the field, but generally place the boring in an upgradient direction from dry well.

e. Soil samples collected in the exploratory boring at 10, 15, 20, 25 and 30 foot intervals shall be analyzed for the parameters listed in table 1 under DA-2.

move to landfill #1

f. Collect one surface water and one bottom sediment samples from three locations adjacent to and downstream along Hutchinson Creek which flows next to the landfill and one location adjacent to but upstream of landfill. Bottom sediment samples shall be collected only once (total four), and surface water samples shall be collected twice (total eight), once during wet seasonal conditions and once during dry seasonal conditions. Analyze surface water and bottom sediment samples for the parameters listed in Table 1.

5. Site 5. Discharge Area No. 3 (DA-3) - SR-71 Shelter

a. Install one groundwater monitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direction from the site.

b. Collect ground water samples from the well according to Section I.A.7. Analyze each ground water sample for the analytes listed in Table 1 under DA-3.

c. Drill six exploratory soil borings according to Section I.A.6. Place five borings at locations in the pad runoff area. Locate one boring upgradient from the pad runoff area to establish background conditions. The exact locations of the borings shall be determined in the field.

d. Monitor boring operations with a photo-ionization meter or equivalent organic vapor dector to identify potential generation of vapors or gases. Visually inspect soil cutting for discoloration and note the presence of any odor in soil. Results shall be documented in boring logs.

e. Select three samples from each exploratory boring for total of 18 soil samples and analyze them for the parameters listed in Table 1 under DA-3.

6. Site 6. Landfill No. 2 (LF-2)

a. Install four groundwater monitoring wells according to Section I.A.4. Determines the exact location in the field, but generally place one monitoring well upgradient of the site, one monitoring well between LF-2 and LF-3, and two monitoring wells downgradient of the site. The upgradient well shall be located such that it shall serve to provide background conditions for both LF-2 and LF-3.

b. Collect groundwater samples from each well according to Section I.A.7. Analyze each groundwater sample for the analytes listed in Table 1 under LF-2.

7. Site 7. Discharge Area No. 4 (DA-4) - Biological Production Site

a. Obtain one-foot hand auger core samples at 16 locations within the fields used for disposal of incinerated wheat rust material. use the 16 core samples to create four composite samples. Exact location of core samples shall be determined in the field.

b. Aanlyze the four composite soil samples for the parameters listed in Table 1 under DA-4.

8. Site 8. Discharge Area No. (DA-6) - J-57- Test Cell

a. Install one groundwater monitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direction from the site.

b. Collect groundwater samples from the well according to Section I.A.7. Analyze each groundwater sample for the analytes listed in Table 1 under DA-6.

c. Collect one two-foot hand auger core at three downstream locations receiving drainage from the site between the site and Reed's Creek. These cores shall be subdivided into one-foot segments for a total of six core segments (zero-one and one-two feet) and analyzed for the parameters listed in Table 1 under DA-6.

9. Site 9. Discharge Area No. 9 (DA-9) - Entomology Bldg 2560

a. Drill three exploratory soil borings according to Section I.A.6. Place two borings within the gravel pad and overflow area and locate one boring upgradient from the gravel pad and overflow area to establish background conditions. The exact locations of the borings shall be determined in the field.

b. Select six soil samples from the borings and analyze them for the parameters listed in Table 1 under DA-9.

10. Site 10. Discharge Area No. 5 (DA-5) - J-58 Test Cell

a. Install one groundwater monitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direction from the sote.

b. Collect groundwater samples from the well according to Section I.A.7. Analyze each groundwater sample for the annalyte listed in Table 1 under DA-5.

c. Collect four two-foot hand auger core samples one each at three downstream locations within the ditch receiveing drainage from the site and one upstream location to establish background conditions in the ditch. These cores shall be subdivided into one-foot segments and analyzed for the parameters listed in Table 1 under DA-5.

11. Site 11. Discharge Area No. 7 (DA-7) - AGE Maintenance

a. Install one ground water mnitoring well according to Section I.A.4. Determine the exact location in the field, but generally place the well in a downgradient direciton from the site.

b. Collect groundwater samples from the well according to Section I.A.7. Analyze each groundwater sample for the parameters listed in Table 1 under DA-7.

c. Drill four exploratory soil borings accordiong to Section I.A.6. Place three borings in the gravel pad area receiving washdown water from the AGE maintenance shops and locate one upgradient boring from the gravel bed and area receiving wash down water to establish background conditions. Exact locations of the boring shall be determined in the field.

d. Select two soil samples from each exploratory boring for a total or total of eight samples and analyze them for the parameters listed in Table1 under DA-7.

e. Collect one two-foot hand auger core sample at four locations within the drainage ditch receiving drainage from the AGEW Maintenance Shops. These cores shall be subdivided into one foot segmants (zero-one and one-two feet) for a total of eight segments and analyzed for the parameters listed in Table 1 under DA-7.

12. Site 12. Discharge Area No. 10 (DA-10) - Entomology Bldg 440

a. Drill three exploratory soil borings according to Section I.A.6. Place two borings within the gravel pad and overflow area and locate one boring upgradient from the gravel pad and overflow area to establish background conditions. The exact locations of the borings shall be determined in the field.

b. Select two soil samples from each exploratory boring for a total of 6 samples and analyze them for the parameters listed in Table 1 and DA-10.

13. Site 13. Landfill No. 1 (~~/~~LF-1)

a. Perform magnetometer and Ground Penetrating Radar (GPR) surveys in the area of Landfill No. 1 and the covered trenches immediately west of the landfill to further define the site and locate buried drums for later investigations if warranted. Conduct the survey as a wide grid survey.

b. Install two groundwater monitoring wells according to Section I.A.4. Determine the exact location in the field, but generally place the wells in a downgradient direciton from the site.

c. Collect ground water samples from each well according to Section I.A.7. Analyze each groundwater sample for the analytes specified in Table 1 under LF-1.

insert from Site 4, f.

14. Site 14. Transformer Drainage Area (DA-8).

Collect one two-foot long hand auger cores at 12 locations within the bermed site. Divide the cores into one-foot intervals (zero-one and one-two feet) and analyze one soil sample per interval per core (total 24? 12) for the parameters listed in Table 1 under DA-8.

15. Site 15. Landfill No. 3 (LF-3)

a. Install two ground water monitoring wells according to Section I.A.4. Determine the exact location in the field, but generally place the wells in a downgradient direction from the site.

b. Collect one groundwater samples from each well according to Section I.A.7. Analyze each groundwater sample for the analytes listed in Table 1 under LF-3.

16. Site 16. EEOD Disposal Area (EEOD)

Collect three surface grab soil samples from the scrap metal disposal trench and three surface grab soil samples from the current ordinance burn pit. Create one composite soil sample from the three grab samples per pit for a total of two composite samples. Analyze each composite sample for the analytes listed in Table 1 under EEOD.

17. Site 17. Best Slough (BS).

a. Drill six exploratory soil borings according to Section I.A.6. Locate five borings downgradient but in close proximity to existing trenches to determine if leachating is occurring and locate one boring upgradient from the trenches to establish background conditions. The exact locations of the borings shall be determined in the field.

b. Monitor boring operation with a photo-ionization meter or equivalent organic vapor detector to identify potential generation of vapors or gases. Visually inspect soil cuttings for discloration. Results shall be documented on boring logs.

c. Collect two one-foot long hand auger soil sample from three trenches in Best Slough and analyze the six soil samples for the parameters listed in Table 1 under BS.

d. Select two soil samples from each exploratory boring for a total of 12 samples and analyze for parameters listed in Table 1 under BS.

e. Collect one surface water sample from near by stream and analyze for the parameters listed in Table 1 under BS.

18. Site 18. Bulk Fuel Storage Facility (BFSF).

a. Drill four exploratory soil borings according to Section I.A.6., with following exception, the boreholes shall be drilled to a depth of 20 feet and core samples collected at each 2.5 foot interval. Locate three borings downgradient of the perimeter fence around the Bulk Fuel Storage Facility. Locate one boring upgradient of the facility to establish background conditions.

b. Monitor boring operation with a photo-ionization meter or equivalent organic vapor detector to identify potential generation of vaport or gases. Visually inspect soil cuttings for discoloration and noter the presence of any fuel odor in soil. Results shall be documented in the boring logs.

c. Select four soil samples from each borehole for a total of 16 soil samples and analyze for parameters listed in Table 1 under BFSF.

C. Well and Borehole Cleanup

Remove all clean well and borehole drill cuttings to municipal landfill and clear the general area following the completion of each well and boring. Only those drill cuttings suspected as being a hazardous waste (based on discoloration, odor, or organic vapor detection instrument) shall be properly containerized and moved to locations within the installation (according to local civil engineering office requirements) by the contractor for eventual government disposal. The suspected hazardous waste shall be tested by the contractor for EP Toxicity (metals) and Ignitibility, and EPA Method 8010 and 8020. The contractor is not responsible for ultimate disposal of the hazardous drill cuttings. Disposal will be conducted by base personnel.

D. Technical Field Operations Plan

1. Develop a detailed field operations plan (Atch 1 Sequence 7, as specified in Item VI below) based upon the technical requirements specified in this task description for the proposed work effort. Be explicit with regards to field procedures. Include, but do not limit the plan to, field decontamination operations, sampling protocol, QA/QC field procedures, field schedule, etc. A guideline for the plan is provided under a separate cover.

E. Health and Safety

Comply with USAF, OSHA, EPA, state and local health and safety regulations regarding the proposed work effort. Use EPA guidelines for designating the appropriate levels of protection at study sites. Prepare a written Health and Safety Plan for the proposed work effort and coordinate it directly with applicable regulatory agencies. Provide an information copy of the Health and Safety Plan to the USAF OEHL prior to commencing field operations (i.e., drilling and sampling).

F. Data Review

1. Tabulate field and analytical laboratory results, including field and laboratory parameters and QA/QC data, and incorporate them into the monthly R&D Status Reports. Forward them to the USAF OEHL for review as soon as they become available as specified in Item VI below. Field and laboratory parameters shall include time and dates for sample collection, extraction and analysis.

2. Upon completion of each round of all analyses, tabulate and incorporate all results into an Informal Technical Information Report (Atch 1, Seq 2 as specified in Item VI below) and forward the report to USAF OEHL for review.

3. Data/results, generated throughout this undertaking, indicating a possibility of health risk (for example, contaminated drinking water aquifer) shall be reported immediately via telephone to the USAF OEHL Program Manager.

F. Reporting

1. A draft report delineating all findings of this field investigation shall be prepared and forwarded to the USAF OEHL (as specified in Item VI below) for Air Force review and comment. This report shall include a discussion of the regional/site specific hydrogeology, well and boring logs, data from water level surveys, groundwater surface and gradient maps, water quality and soil analysis results, available geohydrologic cross sections, and laboratory and field quality assurance/quality control information. The report shall follow the USAF OEHL supplied format (mailed under separate cover). The format is an integral part of this delivery order.

2. The results section of the report shall include water and soil analyses results, field quality control sample data, internal laboratory control data (lab blanks, lab spikes, and lab duplicates), and laboratory

quality assurance procedures. Provide second column confirmation results and include which columns were used, the conditions, and retention times. Summarize the specific collection techniques, analytical method, holding time, and limit of detection for each analyte (Standard Methods, EPA, etc.).

3. The recommendation section shall address each site and list them by categories. Category I shall consist of sites where no further action (including remedial action) is required. Data for these sites are considered sufficient to rule out significant public health or environmental hazards. Category II sites are those requiring additional monitoring or work to quantify or further assess the extent of current or future contamination. Category III sites are sites that will require remedial actions (ready for IRP Phase IV actions). Recommendations for Category III sites shall include any possible influence on sites in Categories I and/or II due to their connection to the same hydrological system. Any dependency between sites in different categories shall be clearly stated. The contractor shall include a list of candidate remedial action alternatives including Long Term Monitoring (LTM) as remedial action and corresponding rationale, that, as a minimum, should be considered in selecting the remedial action for a given site. The list shall encompass alternatives that could potentially attain applicable environmental standards or criteria (state action levels). For contaminants that do not have standards, the contractor may use EPA recommended safe levels for non-carcinogens (Health Advisory or Suggested-No-Adverse-Response Levels) and target levels for carcinogens ($1 \times 10^{-6}$ cancer risk level). If not specifically requested, comprehensive cost or technical analyses of alternatives shall not be included. However, in those situations where field survey data indicate immediate corrective action is necessary, the contractor shall present specific, detailed recommendations. For each category above, the contractor shall summarize the results of field data, environmental or regulatory criteria, or other pertinent information supporting conclusions and recommendations.

4. For those sites in need of additional Phase II effort, identify specific requirements, if any, for future monitoring needed to determine the magnitude, extent, and direction of movement of detected contaminants. Identify potential environmental consequences of discovered contamination, where known. Provide estimates of costs by line items for additional investigations beyond this stage along with estimates of time required to accomplish the investigation. Furnish the cost data in a separately bound appendix to the final report.

5. Include in an appendix to the report the names of all local and/or state and other regulatory personnel and the dates they approved well drilling techniques, materials, well development, purging, and sampling methods. All well drilling, development, purging and sampling must conform to State and/or other regulatory agencies requirements.

G. Meetings

The contractor's project leader shall attend three meetings to take place at times to be specified by the USAF OEHL. The meetings shall take place at Beale AFB for a duration of one day each.

II. SITE LOCATION AND DATES:

Beale AFB CA

Date to be established

III. BASE SUPPORT:

A. The Base Point of Contact (POC) shall receive from the contractor the split samples and then select 10% of them, package them, and then deliver them back to the contractor within 24 hours for subsequent overnight shipment of USAF OEHL/SA as stated in paragraph I.A.6.

B. Base personnel shall assign the disposal points within the installation of all hazardous drill cuttings and contaminated groundwater.

IV. GOVERNMENT FURNISHED PROPERTY: None

V. GOVERNMENT POINTS OF CONTACT:

1. Capt Robart W. Bauer
   USAF OEHL/TSS
   Brooks AFB TX 78235
   (512) 536-2158/2159
   AV 240-2158/2159

2. MSgt Bill Priest
   USAF Hospital Beale/SGPB
   Beale AFB CA 95903
   (916) 634-~~3724~~ 2635
   AV 368-2635

3. Colonel Ronald D. Burnett
   HQ SAC/SGPB
   Offutt AFB NE 68113
   (402) 294-4651
   AV 271-4651

VI. In addition to sequence numbers 1, 5, and 10 in Attachment 1 to the contract, which are applicable to all orders, the sequence numbers listed below are applicable to this order. Also shown are data applicable to this order.

| Sequence No. | Block 10 | Block 11 | Block 12 | Block 13 | Block 14 |
|---|---|---|---|---|---|
| 3 (1st Round of analysis) | O/Time | * | * | - | 5 |
| 3 (2nd Round of analysis) | O/Time | ** | ** | - | 5 |
| 4 | One/R | 13 Jun 86 | 20 Jun 86 | 31 Jun 86 | *** |
| 14 | Mthly | 4 Nov 85 | 8 Nov 85 | **** | 2 |
| 15 | Mthly | 4 Nov 85 | 8 Nov 85 | **** | 2 |

* Upon completion of 1st round of analysis

** Upon completion of 2nd round of analysis and before submission of 1st draft report

*** Two draft reports (25 copies each) will be required. After incorporating Air Force comments concerning the first draft report, the contractor shall supply the USAF OEHL with one copy of the second draft report. Upon acceptance of the second draft, the USAF OEHL will furnish a distribution list for the remaining 24 copies of the second draft. The contractor shall supply 50 copies plus the original camera ready copy of the final report.

**** Monthly thereafter

TABLE 1. SAMPLING, AND ANALYTICAL REQUIREMENTS[1] (INCLUDES 2 ROUNDS GROUND WATER AND SURFACE WATER AND 1 ROUND SOIL)

| ANALYTE | METHOD | MEDIUM (**) | DA-1 | DW No.2 | FPTA 1&2 | DA-2 | DA-3 | LF-2 | DA-4 | DA-6 | DA-9 | DA-5 | DA-7 | DA-10 | LF-1 | DA-8 | LF-3 | EOD | BR | BFSF | Hazardous Soils | Sub Total | 2nd Column Conf. (50%) | QA (10%) | Total |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Purgeable Halocarbons & Aromatics | EPA 601/602 + Xylene | GW | 20 | 12 | 8 | 2 | 2 | 8 | — | 2 | — | 2 | 2 | — | 4 | — | 4 | — | — | — | — | 66 | 33 | 7 | 106 |
| | | SW | — | — | 2 | — | — | — | — | — | — | — | — | — | 6 | — | — | — | 2 | — | — | 18 | 9 | 2 | 29 |
| Halogenated and Aromatic Volitile organics | EPA 8010/8020 | SB | — | 11 | 24 | 8 | 18 | — | — | — | — | — | 8 | — | — | — | — | — | 12 | 16 | 12 | 109 | 56 | 11 | 175 |
| | | BS | 4 | — | 2 | — | — | — | — | — | — | — | — | — | 3 | — | — | — | — | — | 12 | 21 | 11 | 2 | 34 |
| | | WA | 4 | — | 10 | — | — | — | 4 | 6 | — | 6 | 8 | — | — | — | — | — | 12 | — | — | 50 | 25 | 5 | 80 |
| Oil and Grease (IR) | EPA 413.2 | GW | 20 | 12 | 8 | 2 | 2 | 8 | — | 2 | — | 2 | 2 | — | 4 | — | 4 | — | — | — | — | 66 | — | 7 | 73 |
| | | SW | 8 | — | 2 | — | — | — | — | — | — | — | — | — | 6 | — | — | — | 2 | — | — | 18 | — | 2 | 20 |
| | | SB | — | 11 | 24 | 8 | 18 | — | — | — | — | — | 8 | — | — | — | — | — | 12 | 16 | — | 97 | — | 10 | 107 |
| | | BS | 4 | — | 2 | — | — | — | — | — | — | — | — | — | 3 | — | — | — | 12 | — | — | 9 | — | 1 | 10 |
| | | WA | 4 | — | 10 | — | — | — | — | 6 | — | 6 | 8 | — | — | 12 | — | — | — | — | — | 58 | — | 6 | 64 |
| Petroleum Hydrocarbons (IR) | EPA 418.1 | GW | — | — | 8 | — | — | — | — | 2 | — | 2 | — | — | — | — | — | — | — | — | — | 12 | — | 1 | 13 |
| | | SW | — | — | 2 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | 1 | 3 |
| | | SB | — | — | 24 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 16 | — | 40 | — | 4 | 44 |
| | | BS | — | — | 2 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | 1 | 3 |
| | | WA | — | — | 10 | — | — | — | — | 6 | — | 6 | — | — | — | — | — | — | — | — | — | 22 | — | 2 | 24 |
| Heavy Metals: Primary | * | GW | 20 | 12 | — | 2 | — | 8 | — | — | — | — | — | — | 4 | — | 4 | — | — | — | — | 50 | — | 5 | 55 |
| | | SW | 8 | — | — | — | — | — | — | — | — | — | — | — | 6 | — | — | — | — | — | — | 14 | — | 1 | 15 |
| | | SB | — | — | — | 8 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 8 | — | 1 | 9 |
| | | BS | 4 | — | — | — | — | — | — | — | — | — | — | — | 3 | — | — | — | — | — | — | 7 | — | 1 | 8 |
| | | WA | 4 | — | — | — | — | — | 4 | — | — | — | — | — | — | — | — | — | — | — | — | 8 | — | 1 | 8 |
| | | SG | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | 1 | 3 |
| Pesticide & Herbicide | Std 509A & 509B | GW | — | — | — | — | — | 8 | — | — | — | — | — | — | 4 | — | — | — | — | — | — | 12 | 6 | 1 | 19 |
| | | SW | — | — | — | — | — | — | — | — | — | — | — | 6 | 6 | — | — | — | 2 | — | — | 8 | 4 | 1 | 13 |
| | | SB | — | — | — | — | — | — | — | — | 6 | — | — | — | 6 | — | — | — | 12 | — | — | 24 | 12 | 3 | 39 |
| | | BS | 4 | — | — | — | — | — | — | — | — | — | — | — | 3 | — | — | — | — | — | — | 7 | 4 | 1 | 12 |
| | | WA | 4 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 12 | — | — | 16 | 8 | 2 | 26 |
| Phenols | EPA 604 | GW | — | — | 8 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 8 | 4 | 1 | 13 |
| Phenols (total) | EPA 420.1 | GW | 20 | — | 8 | 2 | 2 | 8 | — | 2 | — | 2 | 2 | — | 4 | — | 4 | — | — | — | — | 54 | — | 5 | 59 |
| | | SW | 8 | — | 2 | — | — | — | — | — | — | — | — | — | 6 | — | — | — | 2 | — | — | 18 | — | 2 | 20 |
| | | SB | — | — | 24 | 8 | 18 | — | — | — | — | — | 8 | — | — | — | — | — | 12 | 16 | — | 86 | — | 9 | 95 |
| | | BS | 4 | — | 2 | — | — | — | — | — | — | — | — | — | 3 | — | — | — | — | — | — | 9 | — | 1 | 10 |
| | | WA | 4 | — | 10 | — | — | — | — | 6 | — | 6 | 8 | — | — | — | — | — | 12 | — | — | 46 | — | 5 | 51 |
| Acids and Base/Neutrals | EPA 625 | GW | — | 12 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 12 | — | 1 | 13 |
| | | SB | — | 11 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 11 | — | 1 | 12 |
| PCBs | EPA 608 | WA | — | — | — | — | — | — | — | — | — | — | — | — | — | 12 | — | — | — | — | — | 12 | 6 | 1 | 19 |
| General Explosive Scan | USATHAMA | WA | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | — | — | 2 | — | — | 2 |
| Lead | | GW | — | — | 8 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 8 | — | 1 | 9 |
| | | SB | — | — | 24 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 16 | — | 40 | — | 4 | 44 |
| | | BS | — | — | 2 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 2 | — | 1 | 3 |
| | | WA | — | — | 10 | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 10 | — | 1 | 11 |
| EP Toxicity Extraction for Metals | 40 CFR, Sub C, 261.24 | SB | — | — | — | — | — | — | 4 | — | — | — | — | — | — | — | — | 2 | — | — | 12 | 18 | — | 1 | 19 |
| | | BS | — | — | — | — | — | — | — | — | — | — | — | — | 3 | — | — | — | — | — | — | 3 | — | 1 | 4 |
| EP Ignitability | 40 CFR, Sub C, | SB | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | — | 12 | 12 | — | — | 12 |

[1]All soil analysis shall comply with California Assessment Methods (CAM), except those specifed for EP Toxicity and Ignitability.
[2] All soil analysis shall be accomplishe only once.

**GW = Ground Water
SW = Surface Water
BS = Bottom Sediment (Soil)

Attachment 1: List of Sites

| Site No. | Site Descriptions and Components | # of Samples (*) |
|---|---|---|
| 1 | Discharge Area No. 1 (DA-1) - West Drainage Area | |
| | ground water (GW) | 20 |
| | surface water (SW) | 8 |
| | bottom sediment (BS) | 4 |
| | hand auger (HA) | 4 |
| 2 | Injection Well No. 2 (INJ-2) | |
| | ground water | 12 |
| | soil boring (SB) | 11 |
| 3 | Fire Protection Training Areas No. 1 and 2 (FPTA) 1 & 2) | |
| | ground water | 10 |
| | surface water | 2 |
| | soil boring | 24 |
| | bottom sediment | 2 |
| | hand auger | 10 |
| 4 | Discharge Area No. 2 (DA-2) - Battery Shop Dry Well | |
| | ground water | 2 |
| | soil boring | 8 |
| 5 | Discharge Area No. 3 (DA-3) - 52-71 Shelter | |
| | ground water | 2 |
| | soil boring | 18 |
| 6 | Landfill No. 2 (LF-2) | |
| | ground water | 8 |
| 7 | Discharge Area No. 4 (DA-4) - Biological Production Site | |
| | hand auger | 4 |
| 8 | Discharge Area No. 6 (DA-6) - J57 Test Cell | |
| | ground water | 2 |
| | hand auger | 6 |
| 9 | Discharge Area No. 9 (DA-9) - Entomology Bldg 2560 | |
| | soil boring | 6 |
| 10 | Discharge Area No. 5 (DA-5) - J-58 Test Cell | |
| | ground water | 2 |
| | hand auger | 8 |

Attachment 1: List of Sites

| Site No. | Site Descriptions and Components | # of Samples (*) |
|---|---|---|
| 11 | Discharge Area No. 7 (DA-7) - AGE Maintanence | |
| | ground water | 2 |
| | soil boring | 8 |
| | hand auger | 8 |
| 12 | Discharge Area No. 10 (DA-10) - Entomology Bldg 440 | |
| | soil boring | 6 |
| 13 | Landfill No. 1 (LF-1) | |
| | ground water | 4 |
| | surface water | 6 |
| | bottom sediment | 3 |
| 14 | Transformer Drainage Area (DA-8) | |
| | hand auger | 12 |
| 15 | Landfill No. 3 (LF-3) | |
| | ground water | 4 |
| 16 | EEOD Disposal Area (EEOD) | |
| | surface grab (SG) | 2 |
| 17 | Best Slough (BS) | |
| | surface water | 2 |
| | soil boring | 12 |
| | hand auger | 6 |
| 18 | Bulk Fuel Storage Facility (BFSF) | |
| | soil boring | 16 |

*Numbers below include 2 rounds of sampling on groundwaters and surface waters, and 1 round of sampling on soils, bottom sediments and hand auger samples.

Attachment 2

Analytical Parameters, Parameters, Methods and Required Detection Units

| Parameter | Method | (ug/L for water - ug/g for soil) Level of Detection |
|---|---|---|
| Purgeable Halocarbons and Aromatics | EPA 601 & 602 | a |
| Halogenated and Aromatic Volatile Organics | EPA 8010 & 8020 | b |
| Oil and Grease (IR) Extraction | EPA 413.2 EPA 3550 | 100 |
| Petroleum Hydrocarbons (IR) Extraction | EPA 418.1 EPA 3550 | 100 |
| Heavy Metals Primary (7) | * | c |
| Pesticides and Herbicides | Std 509 A.B | d |
| PCBs | EPA 608 | 1.0 |
| Phenols | EPA 604 | e |
| Phenol | EPA 420.1 | 1 |
| Base/Neutrals and Acids | EPA 625 | ** |
| General Explosive Scan | USA7HAMA | *** |
| EP Toxicity for Extraction of Metals | 40 CFR, Sub C 261.24 | f |
| EP Ignitability | 40 CFR, b C 261.21 | g |

[a]Detection limits for Purgeable Organics shall be as specified for the compounds by EPA Methods 601-602. Method: Federal Register, Vol. 44, No. 233, pp 69468-69473. This method should be strictly followed including these items:

Item 1.4 - This method is recommended by EPA for usy only by experienced residue analysts or under the close supervision of such qualified persons.

Item 2.2 - This is most important. If interferences are encountered, (as in early peaks such as vinyl chloride), the method provides a secondary chromatographic column that will be helpful in resolving the compounds of interest from interferences. This must be done in the case of vinly chloride and so noted in the analysis report.

Item 3.3, 7.1-7.3 - These secions must be analyzed within the recommended holding times.

Item 8.3 - All samples must be analyzed within the recommended holding times. This must be followed without exception.

If analytes analyses exceed the detection limits identified below, second column confirmation is required:

| EPA Method 601 & 602 | Detection Level (ug/L) |
|---|---|
| Benzene | 0.7 |
| Carbon | 4.0 |
| Chloroform | 10 |
| 1,2 Dichloroethane | 0.1 |
| Methylene Chloride | 4.0 |
| Tetrachloroethylene | 4.0 |
| Toluene | 10 |
| 1,1,1-Trichloroethane | 10 |
| Trichloroethylene | 1.0 |
| Vinyl Chloride | 1.0 |
| Dichlorobenzene isomers | Sum greater than 10 |
| Any other organics | 10 |

Retention times on both columns must match before reporting positive value. If no match, it will be considered an interference.

If questions are encountered about certain contaminants, you may be asked to show both chromatograms used to rule out possible interferences.

[b]Items specified in footnote a above should be strictly followed. Detection limits for Purgeable Organics shall be as specified for compounds by EPA Methods 8010/8020. If analytes analyses exceed 10 ug/g in soil, second column confirmation is required.

[c]Primary Heavy Metals:

| Metal | Level of Detection | |
|---|---|---|
| | water (ug/L) | soil (ug/g) |
| arsenic (As) | 10 | 1 |
| barium (Ba) | 200 | 20 |
| cadmium (Cd) | 10 | 1 |
| chromium (Cr) | 20 | 2 |
| lead (Pb) | 50 | 5 |
| mercury (Hg) | 1 | 0.1 |
| selenium (Se) | 10 | 1 |
| silver (Ag) | 10 | 1 |

[d] Pesticides/Herbicides

| Analyte | (ug/L-water, ug/g-soil) Level of Detection |
|---|---|
| Endrin | .02 |
| Lindane | .01 |
| Methoxychlor | .20 |
| Toxophen | 1 |
| 2,4-D | .06 |
| 2,4,5-TP | .06 |

If analytes analyses exceed the detection limits identified below, 2nd column confirmation shall be required.

| Standard Methods 509A and 509B | Detection Level ug/L |
|---|---|
| Lindane | 4.0 |
| 2,4-D | 10.0 |
| 2,4,5-TP (silvex) | 10.0 |
| Any other pesticide greater than | 10.0 |

"Retention times on both columns must match before reporting positive value. If no match, it will be considered and interference."

"If questions are encountered about certain contaminants, you may be asked to show both chromatogram used to rule out possible interferences."

[e] Detection limits for Phenols shall be as specified by EPA Method 604.

If analytes analyses exceed the detection limits identified below, second column confirmation is required:

| Analyte | (ug/L water) Detection Limits |
|---|---|
| 2,4 Dimethylphenol | 400 |
| Pentachlorophenol | 30 |
| Phenol | 1 |

"Retention times on both columns must match before reporting positive value. If no match, it will be considered an interference."

"If questions are encountered about certain contaminants, you may be asked to show both chromatogram used to rule out possible interferences."

[f]

| Metals | ug/L of leaching solution |
|---|---|
| As | 10 |
| Ba | 200 |
| Cd | 10 |
| Cr | 50 |
| Pb | 20 |
| Hg | 1 |
| Se | 10 |
| Ag | 10 |

[g]Find if sample is ignitable at 140 degrees F. or below. If so, it is hazardous waste.

[*]Ref: EPA Methods for Chemical Analysis of Water and Wastes, EPA-600/4-79-020.

[**]Levels of detection are as specified by EPA Method 625.

[***]Level of detection are as specified by USATHAMA.

# APPENDIX B

Detection Limits and
Second Column Confirmation

## A. DETECTION LIMITS

The following are detection limits for the specified analytes:

**Primary Heavy Metals**

| Metal | Level of Detection Water (μg/L) | Level of Detection Soil (μg/g) |
|---|---|---|
| Arsenic (As) | 10 | 1 |
| Barium (Ba) | 200 | 20 |
| Cadmium (Cd) | 10 | 1 |
| Chromium (Cr) | 20 | 2 |
| Lead (Pb) | 50 | 5 |
| Mercury (Hg) | 1 | 0.1 |
| Selenium (Se) | 10 | 1 |
| Silver (Ag) | 10 | 1 |

**E.P. Toxicity**

| Metal | μg/L of Leaching Solution |
|---|---|
| As | 10 |
| Ba | 200 |
| Cd | 10 |
| Cr | 50 |
| Pb | 20 |
| Hg | 1 |
| Se | 10 |
| Ag | 10 |

**Pesticides/Herbicides -- Standard Methods 509A and 509B**

| Analyte | μg/L-Water, μg/g-Soil Level of Detection |
|---|---|
| Endrin | .02 |
| Lindane | .01 |
| Methoxychlor | .20 |
| Toxophen | 1 |
| 2,4-D | .06 |
| 2,4,5-TP | .06 |

## B. SECOND COLUMN CONFIRMATION

If sample analyte concentrations exceed the detection levels identified for the specified methods, second column confirmation will be performed:

| EPA Method 601 and 602 | Detection Level (μg/L) |
|---|---|
| Benzene | 0.7 |
| Chloroform | 10 |
| 1,2 Dichloroethane | 0.1 |
| Methylene Chloride | 4.0 |
| Tetrachloroethylene | 4.0 |
| Toluene | 10 |
| 1,1,1-Trichloroethane | 10 |
| Trichloroethylene | 1.0 |
| Vinyl Chloride | 1.0 |
| Dichlorobenzene isomers | Sum greater than 10 |
| Any other organics | 10 |

**Pesticides/Herbicides**

| Standard Methods 509A and 509B | Detection Level μg/L |
|---|---|
| Lindane | 4.0 |
| 2,4-D | 10.0 |
| 2,4,5-TP (silvex) | 10.0 |
| Any other pesticide greater than | 10.0 |

**Phenols -- Method 604**

| Analyte | (μg/L Water) Detection Limits |
|---|---|
| 2,4 Dimethylphenol | 400 |
| Pentachlorophenol | 30 |
| Phenol | 1 |

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